SCIENTIFIC AMERICAN

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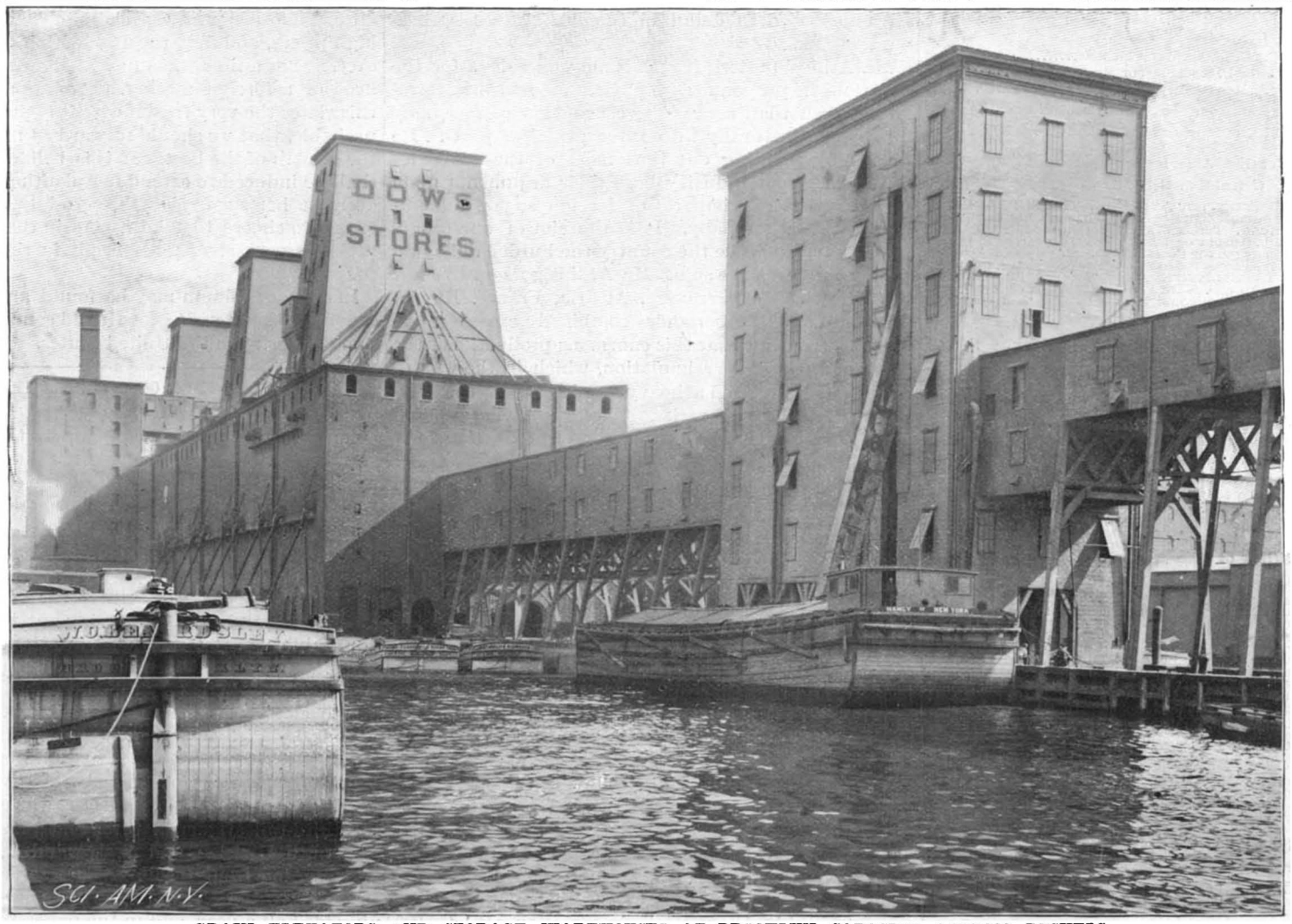
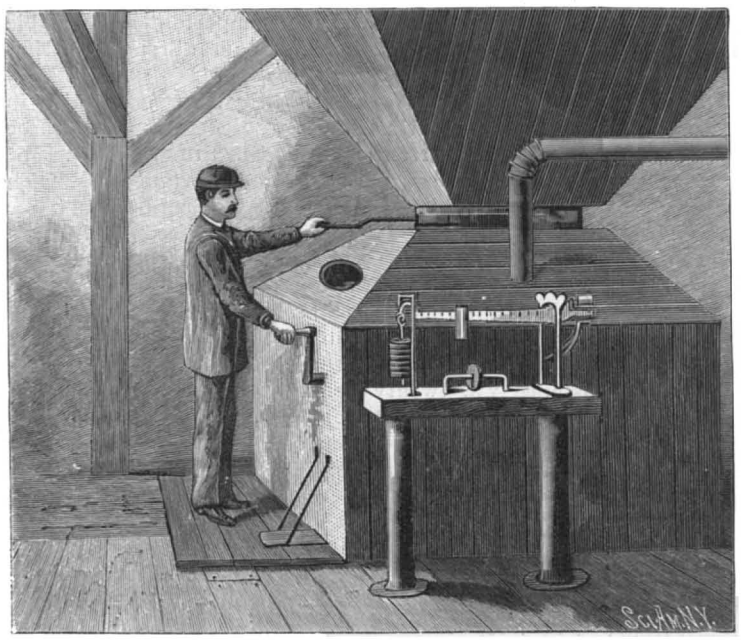


GRAIN ELEVATORS AND STORAGE WAREHOUSES AT BROOKLYN—CAPACITY 2,200,000 BUSHELS.



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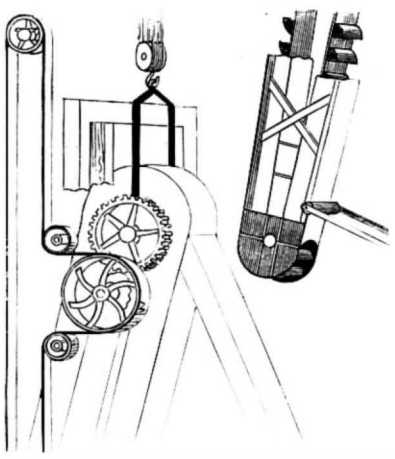

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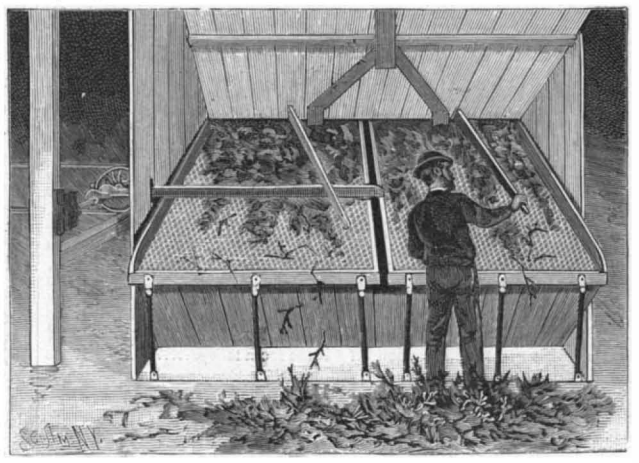

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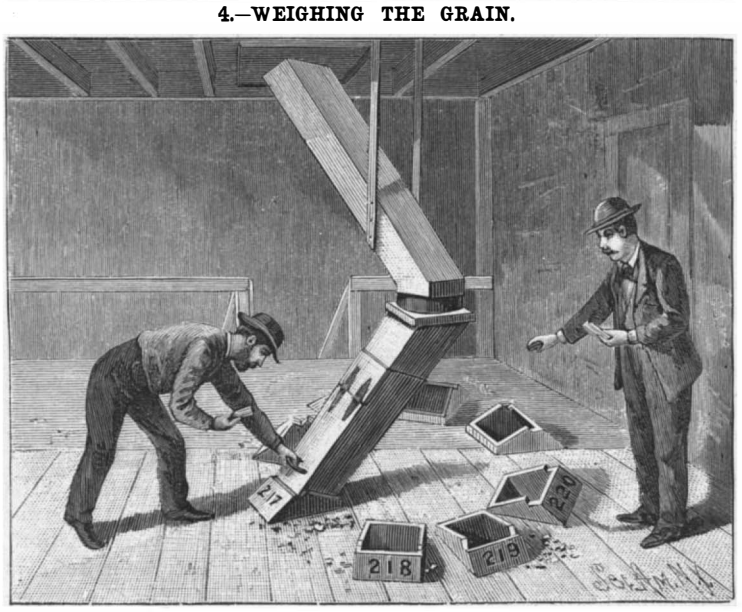

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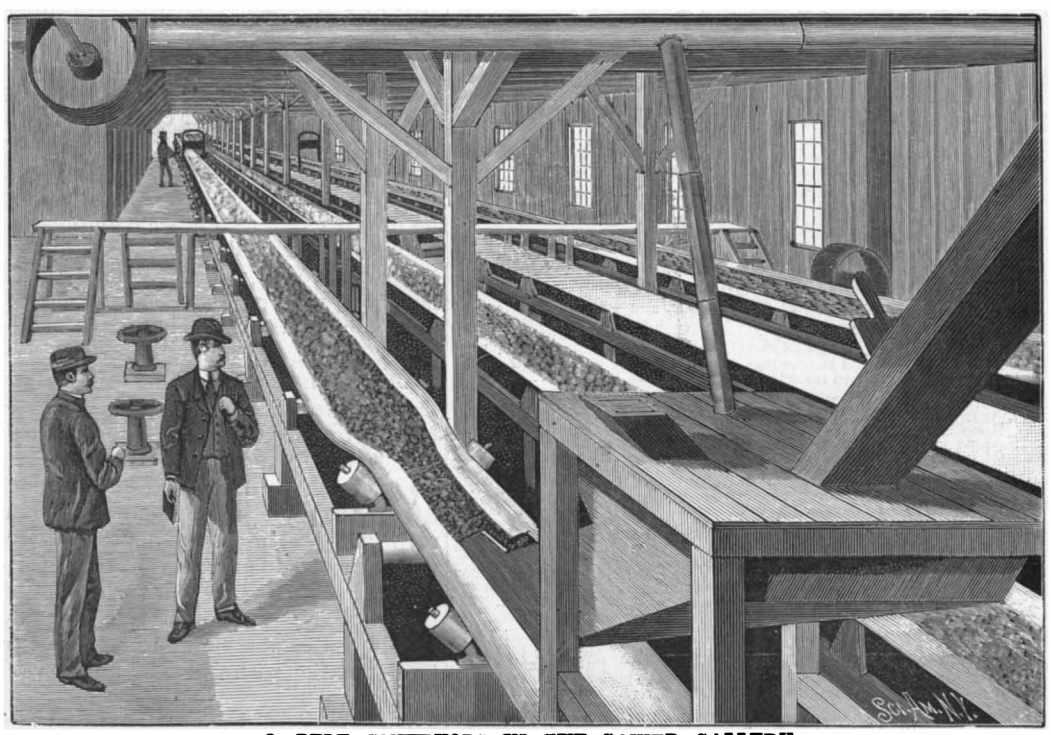

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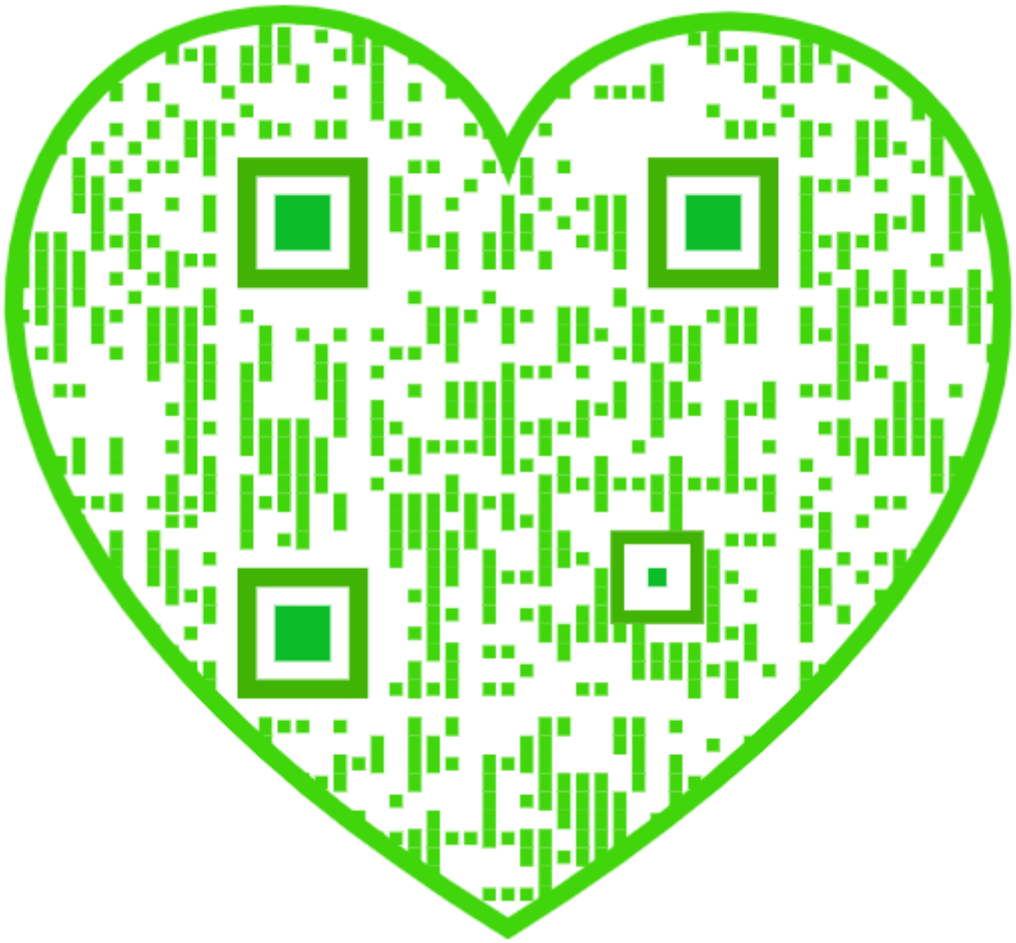

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IS THE BEET SUGAR INDUSTRY DESIRABLE?

In a recent issue of the Forum, Mr. Edwin F. Atkins, the able economist and statistician, has published an article which seems to be in the nature of a protest against the introduction and extension of the beet root industry in this country. Mr. Atkins' article comes at a time when much earnest thought is being given to the production of this staple. It is only within the last month that the establishment of a large plant for treating this product has been opened in this State, the first we believe that has been established in the East. A number of such plants have been established in various parts of the West, and several of them have been described in detail in the SCIENTIFIC AMERICAN.

Mr. Atkins' protest, if such it may be called, for the questions he propounds are put rather in the interrogative form than as a positive assertion of fact, may be divided naturally into three principal parts. He begins by pointing out that most of the advocates of the beet root industry base their arguments upon the fact that our imports of foreign sugars amount to $80,000,000 annually. It is the aim of our economists to try and save the country the burden of having to pay out this large sum. Mr. Atkins goes on to show that the crops of Germany, Austria, France, Russia, Belgium and Netherlands combined exceed some 2,300,000 tons, but that this enormous production is the result of an artificial stimulation, which in the way of bounties has imposed a heavy burden upon the governments of these countries. These products are sold at a price less than the average cost of production, only the best equipped and most favorably located factories being able to make any profit upon their capital and operating expenses. He then asks whether it is wise for us to enter into competition with these countries. We can hardly look at this matter in this faint-hearted light. We believe that although in certain localities the price obtained may not exceed the cost of production, it should be borne in mind that protected by our high tariff the American producer can look to a margin of profit which does not exist in the case of his foreign brother, and that therefore, assuming he may be able to produce at the same cost as the European farmer, he may be still able to sell at the current market price and yet make a comfortable profit over the cost of production. This we can readily follow without touching upon that vexed question of federal or state bounties.

The question of revenue is next taken up, and it is pointed out that under normal conditions, Uncle Sam derives about $50,000,000 of revenue from the sugar tax, taking last year's importation of 1,450,000 tons as a basis of computation. It is then asked, what is going to become of Uncle Sam if this large revenue should be cut off? Our understanding of the objects and aims of our system of import duties is not that they are imposed with the object of hindering or curbing the development of any established industry or product, but rather of fostering such enterprises. We cannot see, therefore, how such an argument can be allowed to stand in the way of our internal development. It might be stated, with equal propriety, that it is a disadvantage for our people to grow wool or produce wines because of the enormous revenues which the government would receive in case all such articles had to be imported from abroad.

The third argument advanced by Mr. Atkins touches the question of the mode of payment of these large indebtednesses. He goes on to show that these sugars are not paid for in cash, but with our own commodities, which are sent in enormous quantities in exchange therefor. He publishes a table in which he shows that to the fifteen countries furnishing us with sugar valued at $82,554,183 we have exported merchandise reaching the enormous sum of $219,708,653, the major part of which exports were agricultural products.

About twenty-five per cent of the total imports from the countries mentioned consisted of sugar. He then states that these countries would be involved in ruin were it not for this export trade, and that they would not be able to pay us for such purchases as they might wish to make, and that the European countries, not being able to sell us sugar, would turn their attention largely to the production of the agricultural products they are now taking from us. It seems as if it were a somewhat false position for us to assume, that we must curtail our home productions and industries in order to maintain foreign trade relations. Were such a theory carried to its legitimate practical conclusion, we should ever be on our guard in developing our home industries for fear that by so doing we should jeopardize the market for the exportation of our own products. On general principles there is no more reason why we should take measures to prevent the production of the beet root than we should to prevent the establishment of woolen or cotton mills, through fear that by so doing we should not be able to hold our export trade with some foreign nation with whom we now have reciprocal trade relations.

We believe it is to our advantage to produce as much as possible of the various articles which it is now necessary for us to import from abroad, and we believe that any system of restriction in order to maintain foreign trade relations would be distinctly a retrograde movement and harmful to our industrial development.

Mr. Atkins, we think, is somewhat inconsistent in his following inquiry: What would be the gain to American farmers should they produce beets at the sacrifice of their market for wheat, grain and other products? With wheat selling at $1 a bushel, he believes that Europe will probably decrease its sugar sowings and increase its sowings of the wheat which had been neglected. He points out that with a policy of extreme protection, it will probably react upon us abroad another year, especially in view of the present high prices, and that the production of grain may be excessive at a time when our producers will be most in need of a foreign market. From our point of view, this states the very reason why it is possible, and even probable, that we should forward as much as possible the growth of the beet. If it is believed that Europe shall be induced to extend her planting of cereals and decrease her sugar growth, certainly this is the time for us to choose to take a step in the direction of establishing ourselves more firmly in the production of the sugar beet.

In another column may be found an account by an expert on the present growth and condition of the beet sugar industry in the United States.

THE APPLICATION OF ELECTRICITY TO STEAM RAILROADS.

One of the most important papers that has recently appeared on the subject of electrical traction was read by Colonel N. H. Heft, chief of the electrical department of the New York, New Haven and Hartford Railroad, at the convention of the American Street Railway Association at Niagara. Our readers will remember that the author of the paper has had charge of the costly experimental work which the New Haven Railroad Company has been carrying out to determine the applicability of electric traction to standard steam railroads. The roadbed, equipment and power plant of the new system was very fully described and illustrated in two articles in the SCIENTIFIC AMERICAN of June 12 and 26. Briefly stated, the experiments consisted in the electrical equipment of seven miles of track between Nantasket Junction and Pemberton, where the overhead trolley was used; and later the equipment with the third-rail system of three and a half miles on the Plymouth Division, and twelve and a half miles on a line running from Berlin to Hartford. The last of these lines (from Berlin to Hartford) has now been running for half a year, and in the paper read at the convention Colonel Heft was able to give the results of what is undoubtedly the most important and reliable test of electrical traction on steam railroads that has yet been made.

The paper, which is too lengthy for reproduction in the columns of the SCIENTIFIC AMERICAN, will be found in the current issue of the SUPPLEMENT. We give, however, some of the more important facts which were mentioned by the author. In the first place, the company are more than ever convinced of the importance to any transportation agency working in a thickly populated territory of uniform fares and a frequent and regular train service—one which requires no printed schedule. On the Nantasket Beach line, before the advent of electricity, the fare for a certain distance was twenty-eight cents; when it was electrically equipped, a half-hourly service was given and the fare was cut down to ten cents. The result has been that the first summer, 1895, showed an increase of 92·6 per cent in the number of passengers carried: the following summer showed an increase of 45·1 per cent over 1895, and the summer just passed showed an increase of 300 per cent over the number carried in the last year of steam traction.

The line between New Britain and Hartford, 9·3 miles in length, runs in direct competition with a trolley line between the same points. The time by the latter is fifty-five minutes and the fare fifteen cents as against less than twenty minutes by the third-rail line and a fare of ten cents The trains were run on a half-hourly schedule, and the sound financial policy of the reduction of the fare from twenty-three cents to ten cents is shown by the fact that during the three summer months 400 per cent more passengers were carried than during the corresponding months of last year, when steam was yet in use on this line.

In the matter of practical operation the electric motor has again demonstrated its special adaptability to a service in which stops are frequent and rapid accelerating power is at a premium. On the Nantasket Beach line, 10·6 miles in length, there are no less than seventeen stations, the average distance between which is about 0·6 of a mile, yet the whole distance is run at an average speed of 24·6 miles per hour, including the sixteen stops—a feat that is entirely beyond the power of steam locomotives. The 9·3 miles between Hartford and New Britain were covered regularly by motor cars with two trailers in from 18 to 20 minutes at an average speed of about 30 miles per hour, and with a special high geared motor a maximum speed of over

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60 miles per hour has been made; the entire distance of 9·3 miles being covered in ten minutes.

The electric motor compressed air brake (Westinghouse type) has given excellent satisfaction. With regard to the third-rail transmission, it is stated that the contact shoes have proved satisfactory, though they have occasionally been carried away by the approach blocks at grade crossings. The system of insulation adopted has also given good results, as shown by the fact that when the ties have been two inches under water, as has frequently happened, it has been possible to operate the road without the slightest difficulty, the electrical output at such times, as recorded by the wattmeter, being normal. The bonding of the service rails with four copper leaf bonds, having a combined conductivity equal to that of the rail, has shown on careful test that the joints have slightly greater conductivity than the rails themselves.

The dangers of the third rail have proved to be lighter than anticipated, if, indeed, they can be stated to exist. People have stepped from the ground to the third rail without feeling the current. Many employes have at times received, through carelessness, the heaviest shock possible with little inconvenience, and those who are highly susceptible to electric shock have recovered fully in a few minutes after receiving the current.

On the score of economy of operation, it is difficult to give comparative figures, for the reason that the company is burning "sparks" (half consumed coal from the locomotives) in the boiler furnaces of the power house. At the Berlin power station, which is not being worked at anything like its full capacity, the cost of fuel, with the use of coal, has been nine mills per horse power hour, or twelve mills per kilowatt hour. When sparks are used the cost is three mills per horse power hour, or four mills per kilowatt hour.

STILL ANOTHER DODGE TO DEFRAUD PATENTEES.

The allurements held out to patentees by the many so-called "Patent Brokers" to put inventions in their hands for sale are now pretty well known, and it is only the unwary, unfamiliar with their many ingenious methods, that suffer loss.

Our attention has been called to a dodge which for plausibility and smallness of expected results is somewhat remarkable. The usual typewritten form is avoided; but instead a letter in the handwriting of the broker is sent to the patentee, assuring him that he has parties anxiously waiting to purchase the patent at the price the patentee asks, but, like every prudent purchaser of real estate, will not pay over the money until an abstract of the title of the patent is furnished. He (the broker) must have this abstract of title before his party will be prepared to close the bargain, and the patentee is recommended to employ some confederate in the same or some other place to secure the abstract, as he (the broker) has nothing to do with the soliciting of patents. The patentee generally has not sold any part of the patent and his title is good, but, being confused by the statement presented and attracted by the prospect of a quick sale, writes to the confederate for terms to secure the abstract of title.

The latter replies, quoting a stiff fee, and, if the remittance comes from the patentee, secures the abstract and sends it to him. The patentee then forwards the abstract to the patent broker and asks for a prompt closing up of the business, but either fails to get a reply or, if he does, one at least that is evasive. In the meantime the confederate divides the profit in the transaction, perhaps four dollars, with the patent broker who wrote the first letter. If, however, the patentee secures his own abstract of title and sends it to the patent broker, the latter replies that his prospective buyer became tired of waiting and went home, but had telegraphed him to come to his place, if all was straight, and close the sale. The broker also informs the patentee that he will be glad to visit the prospective purchaser if he (the patentee) will remit a sum (naming it) sufficient to cover his railroad fare, or instead of the money he may send a railroad ticket, which of course the patent broker could sell and secure the money therefor. Thus the patentee pays well to secure the abstract and at the same time is chagrined to find the supposed sale on which the abstract is based is bogus. Abstracts of title can be readily secured at small expense, either by the patentee himself or a reliable attorney.

Another form of fraud comes from an alleged finance company in London, who are acquainted with many large English manufacturers contemplating the purchase of factory sites in the United States in consequence of the new tariff. Numerous inquiries are made concerning rights to manufacture under American patents, and the American patentee is asked what is the lowest figure he will take for his invention.

Before the patent can be placed, a legal investigation into its scope, validity, etc., will be necessary, for which a moderate fee is called for and asked to be remitted without delay, and a commission will also be deducted, should success attend a sale. Unless the terms proposed are fully complied with, the American patentee is requested not to reply. Here, as in the other case mentioned, the prospect for effecting a sale of the patent is the chief incentive set forth for the patentee to comply, and we imagine by many the motive will be easily discerned. It is to be hoped the exposition of these fraudulent schemes will result in their limitation and prevent many would-be patentees from being defrauded.

POST OFFICE FRAUD ORDER ISSUED AGAINST WEDDERBURN & COMPANY.

A fraud order has just been issued by the Post Office Department against John Wedderburn, John Wedderburn & Company and the National Recorder. An order of this kind deprives the parties against whom it is directed of all use of the United States mails. Hence all mail received for the parties mentioned at the Washington post office will be marked indicating that the business of these attorneys is fraudulent and will be returned to the senders. Money orders sent to the firm or the paper will be similarly dealt with.

It was stated at the conclusion of Assistant Commissioner Greeley's report on the Wedderburn case that the fact that the United States mail was being used by the respondent to promote schemes of fraud was called to the attention of the Post Office many months before the investigation. The report says, "The matter was placed in the hands of an official of that department who, for some reason, failed to do his duty. He has since, I am informed, been dismissed, and criminal proceedings against him for misconduct in office are pending."

About three weeks ago Gen. Tyner, Assistant Attorney-General for the Post Office Department, commenced an investigation in which he departed from the usual course in such cases by granting attorneys for Wedderburn & Company an extended hearing. The case was placed before the Postmaster-General, who, after careful consideration, decided that the fraud order should be issued.

The United States statutes under whose authority this action has been taken forbid the use of the mails by any persons conducting "schemes devised for the purpose of obtaining money or property under false pretenses," etc., and the Postmaster-General has authority to issue fraud orders "upon evidence satisfactory to him."

JAMES E. SIMPSON.

Mr. James E. Simpson died October 27, at Fall River, Massachusetts. Mr. Simpson is very widely known on both the Atlantic and Pacific coasts of the United States, among ship builders, ship owners and shipping merchants, he being the patentee and originator of timber graving docks. Mr. Simpson was born July 13, 1813, and was therefore in his eighty-fifth year. The earlier portion of his life was devoted to the building and repairing of vessels, and while so engaged the idea of timber graving docks was conceived by him, and with the courage and energy which characterize the man, he carried out successfully the Simpson system of timber dry dock construction, which system has gained a world-wide reputation. Our Atlantic coast is dotted with these monuments of his skill, and there are also docks of his construction in the British possessions northeast of our own territory. The United States government, as well as the Colonial government of Newfoundland, have, from time to time, commissioned him to build dry docks for public uses.

THE Commissioner of Patents, Hon. Benjamin Butterworth, was suddenly subjected to a severe attack of pneumonia the first part of last week, while he was stopping at the Hollenden Hotel, Cleveland, O. For two or three days his life was almost despaired of, and his family and near friends were called to his bedside. The latter part of the week, however, his condition greatly improved, and the advices as we go to press are to the effect that he will probably recover. This, it is to be hoped, will be speedily followed by his early restoration to complete health, as the Patent Office could ill afford at this time to be deprived of his services.

WHILE the pioneer work of exploration has been to a great extent accomplished in Africa, and the lines have been run in all directions, says the Popular Science Monthly, Mr. Scott Keltie speaks of the broad meshes between these lines as still needing to be filled in; and one or two regions yet remain that afford scope for the adventurous pioneer. One region of considerable extent, still practically unknown, is south of Abyssinia, and west and northwest of Lake Rudolf, on to the upper Nile. Another extensive area is in the western Sahara. All over the continent are regions that will repay special investigation. Even in northern Africa, an English traveler, Mr. Cowper, has found, not far from the Tripoli coast, miles of magnificent ruins, and much to correct on our maps; and but little is known of the interior of Morocco and the Atlas Mountains.

THE AMERICAN BEET SUGAR INDUSTRY.

In the struggle to gain a foothold in the agricultural economy of this country the history of the sugar beet has simply repeated itself. Europe scoffed at the idea of extracting palatable sugar from such a common garden vegetable when in 1747 one Marggraf, a member of the Berlin Academy of Sciences, announced that, after experimenting with various plants, he found the sugar beet richest of all in saccharine matter, his analyses showing a content of six per cent. Her scoffing availed, Marggraf could not secure the aid necessary to the pursuit of his investigations and was consequently obliged to abandon his project. Half a century later a pupil of his, Acharot by name, who had followed up his master's theories, obtained such excellent results that in 1799 he called the attention of the French Institute to the possibilities of this new factor in agriculture. That body heard him willingly and found the discovery worthy of its profound attention. Later on the great Napoleon became interested in the subject, foresaw the value of the sugar beet to France and in 1811 issued an imperial decree in its behalf. When he was overthrown, the industry—for such it became under his fostering care—almost went down with him, only one factory surviving the general disaster, but it gradually recovered until at length France had hundreds of plants. Germany in the meantime had awakened to the fact that it was neglecting a matter of vital interest to the nation. The industry soon made rapid strides there, and to-day sugar factories dot the landscape all over the country. Austria-Hungary, Russia, the Netherlands and even Scandinavia followed the lead, and while in some of these countries the development has not been very great, whatever headway that has been made has been gained only after tedious difficulties in overcoming prejudice.

So it was in this country that the industry has become established here only after repeated setbacks, shipwrecks being strewn along its path for half a century. As far back as 1830, or about the time that it really obtained a permanent footing in France, the manufacture of sugar from beets was attempted near Philadelphia, with most disastrous results. Eight years later another experiment was made at Northampton, Massachusetts, but with no better outcome. Then interest lagged for twenty-five years or so, when a factory was put up at Chatsworth, Illinois. It was run unprofitably for a few seasons and then removed to Freeport, in the same State. Here again failure was encountered and a part of the machinery was taken to Black Hawk, Wisconsin. Meanwhile experiments had been made at Fond du Lac which attracted the attention of capitalists, with the result that the field of pioneer work was transferred to California, where at length—in Alvarado—the first successful beet sugar plant in this country was established. Later on a second one was built at Watsonville, near San Francisco, so that at the beginning of 1890 two factories were permanently located. In the fall of the same year the plant at Grand Island, Nebraska, began operations, and, responding to the provision for two cents a pound bounty on refined sugar in the McKinley act of October, 1890, three more plants were built the following year—one at Lehi, Utah, one at Norfolk, Nebraska, and one at Chino, California. Under the same act a factory also went up at Staunton, Virginia, which, however, was not long after destroyed by fire. A change of administration, followed by the repeal of the bounty in August, 1894, stopped further progress in the industry until 1896, when a plant located in Berthierville, Canada, was removed to Eddy, New Mexico, and operated there. Another one was also built at Menominee Falls, Wisconsin, but, not being completed in time to work the crop, the company erecting it failed. The past summer the second of the Canadian factories was removed from Farnham to Rome, New York, and will begin its first campaign there this fall. These two Canadian factories, by the way, were omitted from particular mention because they were not located in the United States. Their aggregate output for the past four years has been only 1,400 tons — a mere bagatelle. A new plant has also been installed this year at Los Alamitos, California, and within the past few years both the Watsonville and Chino factories have been enlarged to double their original capacity.

This fall, therefore, we shall have in operation nine beet sugar plants whose daily capacities in tons of beets per day of twenty-four hours each are approximately as follows:

Watsonville, Cal.	1,000
Chino, Cal	850
Alvarado, Cal.	400
Los Alamitos, Cal.	350
Lehi, Utah	400
Grand Island, Neb	400
Norfolk, Neb.	400
Eddy, N. M.	200
Rome, N. Y.	200
Total	4,200

Last year the seven of these plants that were then in operation produced about 40,000 tons of sugar. What the output of this season will be can only be estimated roughly at this date, but it ought to be between 45,000 and 50,000 tons.

(To be continued.)

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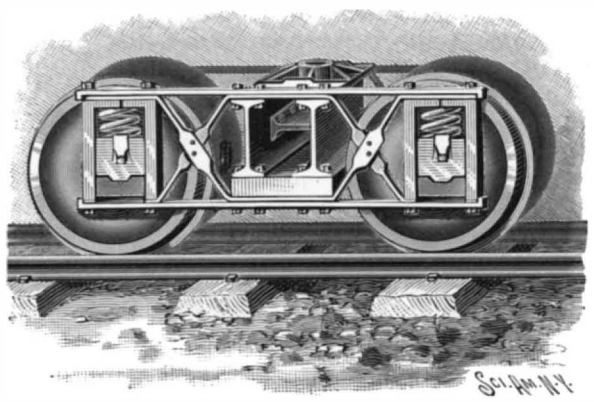
The New York Public Library Award.

The jury of award has decided unanimously that the design of Carrère & Hastings, of New York, shall be the one used in building the new Public Library building on the site of the old reservoir. This is the result of the second competition, in which twelve architects took part. The second choice of the jury was the design of Howard & Cauldwell, and the third, McKim, Mead & White. The work of preparing the plans for the building has been going on for more than a year and two competitions were held, both of which were conducted with the greatest care and fairness. Eighty architects competed in the first competition, and twelve of them were given prizes. Six of these prize winners were selected and asked by the committee to compete with six architects, with the result given above. It is said the building will cost $1,700,000.

AN IMPROVED CAR TRUCK.

The illustration represents a car truck of simple construction in which the journal boxes are provided with sectional guides, so supported that any pair of wheels may be quickly and conveniently removed or replaced as may be necessary. The improvement has been patented by Henry Weston (address in care of John S. Rockwell, Erie County Savings Bank Building, Buffalo, N. Y.) The side frames of the truck, as will be seen by the engraving, are so braced as to be exceedingly strong, while the construction is very simple. The upper portions of the journal box guides, and also the spring seats, are made in two parts, the sections of the guide boxes being of any approved construction and the vertical legs of the guides being provided with slideways on their inner faces to receive the boxes.



WESTON'S CAR TRUCK.

The International Geological Excursionists.

DEATH OF ONE WHILE ASCENDING GREAT ARARAT.

Mr. E. O. Hovey, who was one of the party on the Caucasus excursion, thus describes one of the sad features that occurred to mar the pleasure of the excursionists.

In view of the widespread report of the death of one of the party on Great Ararat, it may be well to give a brief outline of the ascent of the mountain and the circumstances of his loss. The party of twenty-eight took carriages to Aralykh and thence went on horseback the next day to Soudar-Boulagh, the Cossack camp on the saddle between the two peaks, arriving in the middle of the afternoon. Only the ascent of Little Ararat (13,000 feet) was contemplated by our leader, and no preparations were made for the ascent of Great Ararat (17,000 feet). Eight men, however, thought they would attempt the higher mountain, in spite of insufficient equipment and time, and they started out in two parties. One of them, consisting of E. Stoeber, of Wladikavkaz, Prof. Oebling, of Berlin, and Dr. Oswald, of Strassburg, got away earlier than the others and spent the night with their Cossacks well up on the mountain slope. The second day an early start was made, and Stoeber, who, on account of his knowledge of Russian, was the organizer of the little party, pressed on ahead of the other men, who were more experienced mountaineers, and was soon out of sight. Members of the other party of five saw him at an elevation of about 15,000 feet, but he had gone before they reached the spot where he had stood, and receiving no response to their shouts, they supposed he had descended, and they came down the mountain without attaining the top. Oebling and Oswald reached the summit late in the afternoon without seeing anything more of Stoeber. They came down the mountain as far as they could before dark, but were obliged to spend a severe night in the snow and reached the Cossack camp again some hours after the main party (who in the meantime had made a very successful ascent of Little Ararat) had departed for Aralykh. The two belated ones understood, from what the Cossacks said, that Stoeber had returned and gone on with the others, so they journeyed leisurely along, overtaking the main party at Erivan the next day. Then for the first time it became known that Stoeber was not with us, and that he must have been on the mountain for three nights. Telegrams were sent to Aralykh at once, and Cossacks sent out on the search, and the next day Stoeber's body was found, after it had lain on the mountain four days and nights. He had slipped and broken his left leg just above the ankle. He must have fainted from the shock, and have frozen to death without recovering consciousness, for his leg was not drawn up, his hands were not clinched, and he had made no effort to get his brandy flask, to make any farewell note of his condition, or to move from where he had fallen. His death must be put down to his own recklessness in pushing on alone on such an expedition. He was a young man, an apothecary having a dilettant interest in geology.

A SIMPLE CAMERA.

The popularity of photography is due not less to the simplification of the camera than to the invention of the dry plate. The perfection of the dry plate opened photography to all who could afford it, but the invention of simple and inexpensive cameras rendered picture making practical for every one.

We give exterior and interior views of a camera designed to suit the requirements of a large number of amateur photographers who desire a low priced instrument which is simple, easily managed and which will take a picture of fair size and quality.

This camera, which is known as the "Ray" camera, is made by Mutschler, Robertson & Company, of 175 West Main Street, Rochester, N. Y. The front of the camera, which is removable, is provided with an opening near the center opposite the lens inserted in the partition closing the front of the box. There is also a small opening in the front piece near the top in which is placed the finder lens, the reflector and ground glass of the finder being fixed in the body of the camera. The shutter is the acme of simplicity. A metal disk is mounted on a spindle extending through the camera front, and provided with a milled head by which the shutter may be set. An eccentric pin projecting from the disk near the spindle receives the loop on one end of the coil spring, the other end of which is attached to a screw inserted in the front board. The disk has an oblong opening through which the plate is exposed as the shutter turns, two lugs extend from the face of the disk at its periphery, and a stop pin projects from the disk near one of the lugs. The detent which is pivoted to the front has a double-acting spring consisting of a straight piece of spring wire extending through a loop which projects from the front. The inner end of the detent extends toward the disk in position to engage the lugs or the stop pin. A check spring secured to the front board bears lightly upon the shutter and serves as a stop to prevent the recoil and reopening of the shutter.

The shutter is set by turning the disk by means of the milled head until the spring is extended and passes the center of the disk, and one of the lugs rests against the detent. The rotation of the shutter is always in the same direction, so that the disk acts as a safety shutter of the most efficient kind. In the outer surface of the front board is inserted an adjustable stop by which the aperture may be varied to suit different kinds of work. The end of the detent extends through the side of the camera, where it may be easily operated for an instantaneous or time exposure.

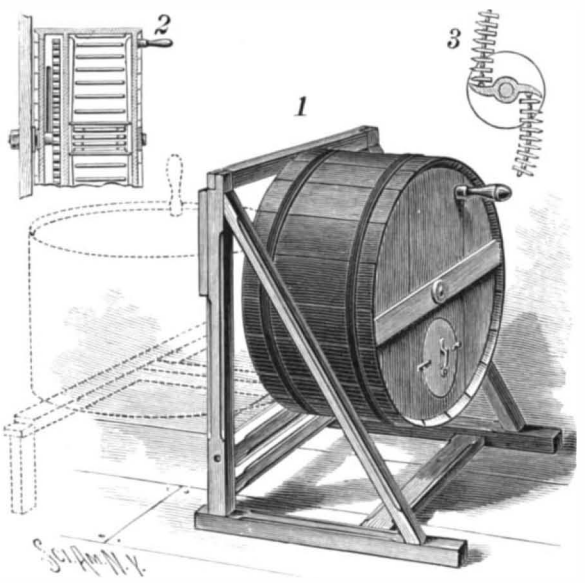
The rear end of the camera box has a space for plate holders. The plate holder is very light, simple and inexpensive. It is made of thin sheet iron, the parts being ribbed to render them rigid and connected together by folding or seaming, making a very compact light-tight holder. The slide is made of hard rubber and provided with a brass binding having an upwardly projecting loop for convenience in handling. The holder is provided with a fastener to prevent the accidental movement of the slide and is furnished with an efficient light stop for preventing the entrance of light as the slide is withdrawn.

The holder is furnished with a spring which holds the plate down in the channel at the bottom, so that it cannot accidentally become detached and fall out of the holder. Plates can be very easily inserted and removed. When the holder is inserted in the camera it is automatically locked, so that there is no danger of admitting light when the slide is withdrawn. Two such holders are furnished with the camera, and there is sufficient room for four additional holders. The holders are so light and compact that an additional half dozen or dozen can be readily carried in the pocket. The camera is provided with a suitable handle, and is furnished with a socket for receiving the screw of a tripod.

THE Havana floating dry dock, illustrated in our issue for October 16, 1897, reached Havana on November 7, after a successful voyage.

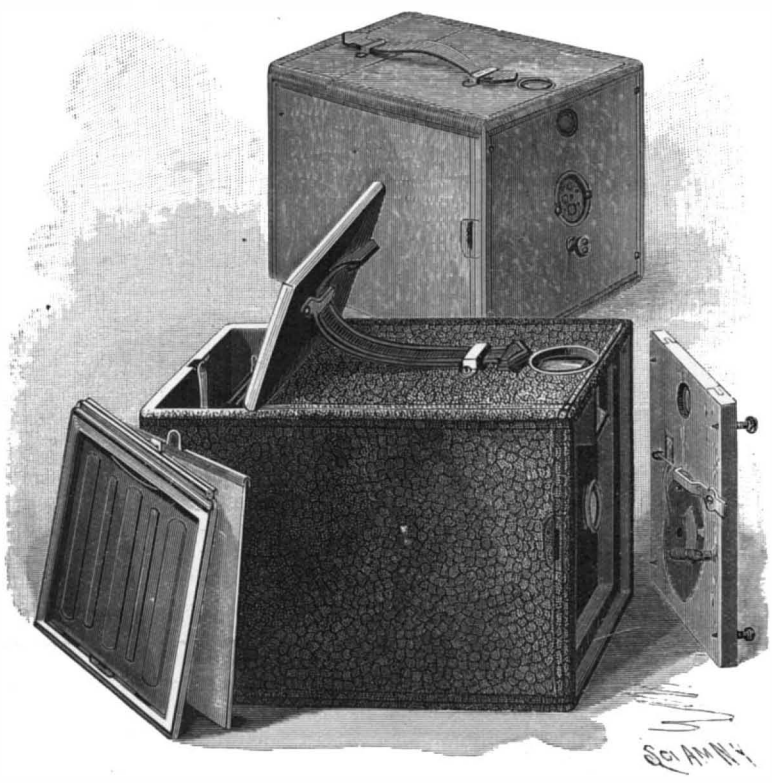
AN IMPROVED WASHING MACHINE.

The accompanying illustration represents a washing machine which is claimed to work very easily, and in which the washing of clothes is said to be accomplished very quickly and efficiently, being greatly facilitated by the action of the beaters inside the drum. The improvement has been patented by Fred R. C. Pitzler, Lester Prairie, Minn. The drum of the machine is adapted to be turned over to horizontal position when the soapy water and clothes are to be placed in it, as indicated by the dotted lines in Fig. 1, Fig. 2 showing a section through the drum, and Fig. 3 representing the cylinder shaft with the attached beaters. Pivoted low down in the uprights of the framework is a cross bar joined at its center by a vertical bar with the top cross bar, the vertical bar and the two cross bars forming supports for the drum and allowing it to be swung to horizontal position, in which it is supported by posts hinged to the ends of the top cross bar, which then swing down into supporting position, as indicated by the dotted lines. The central shaft is fixed to the vertical bar, and does not rotate, but the drum is mounted to rotate on a sleeve which turns on the shaft, and the drum has a small inner watertight section containing gear wheels by which are operated beaters attached to the sleeve as the drum is rotated by the handle at one side, the sleeve being rotated by the gearing much more rapidly than the drum. The drum has on its inner periphery a series of longitudinal ribs, and the heads of the drum are also provided with radial ribs, there being in the outer head a filling opening through which the clothes are inserted. The beaters are attached, by means of cords or chains, to longitudinal flanges on the sleeve, and as the latter rotates the beaters are thrown outward by centrifugal force, striking the clothes and causing them to receive at the same time a rapid pounding and rubbing.



PITZLER'S WASHING MACHINE.

THE following telegram, dated October 18, has been received by the Royal Society from the Royal Geographical Society of Australasia relating to the experimental boring now in progress in the coral island of Funafuti: "September 16. 643 feet. Last 120 feet, coral reef rock. Still boring. Wrong machinery last year."



THE RAY HAND CAMERA.

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HANDLING THE GRAIN CROP AT THE PORT OF NEW YORK.

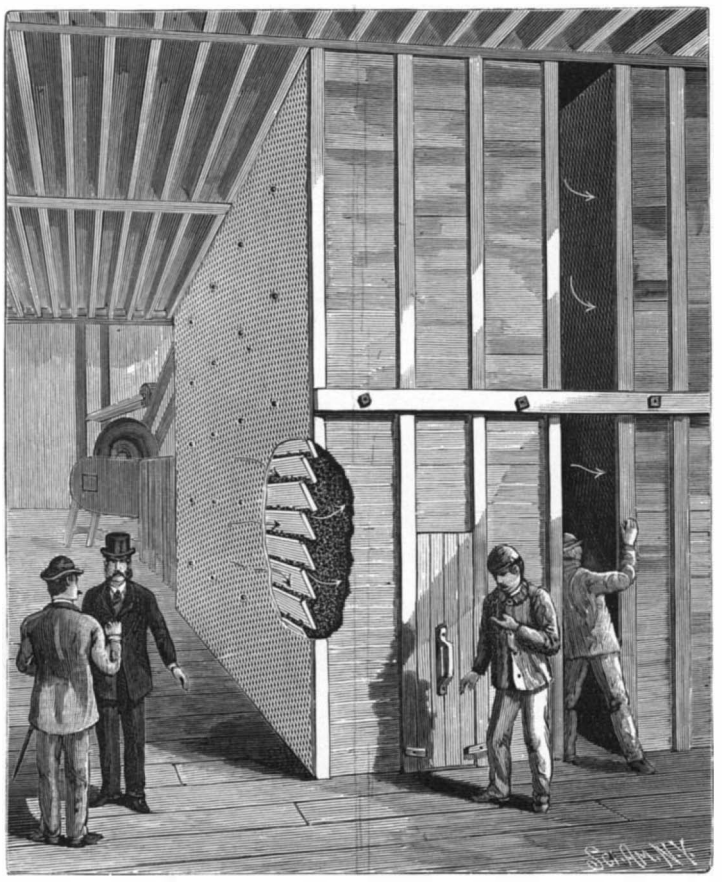
The phenomenal wheat crop for the year 1897, estimated at about 500,000,000 bushels, has not only lifted a burden from the shoulders of the farmer, but it has produced an unwonted activity on all the various systems of transportation by rail, river, canal or ocean. It is not often that Nature has dealt so kindly with this country as she has this year; for the season of propitious rains and sunshine which has favored the wheat fields of America has seen the crops of Europe blighted by one of the most disastrous seasons in the history of that continent. In Argentina and India, moreover, the crops have been light; and, while the American farmer will regret the disappointment and hardship which must follow a crop failure in those countries, having felt something of the bitterness of it himself in other years, he will naturally rejoice in the bettered circumstances in which this year's plenty has placed him.

It is estimated that over 200,000,000 bushels of our wheat will be required by the Old World, and it can well be understood that the shipment of this vast bulk will materially improve the finances of the various transportation companies that carry it from the interior points to the seaboard and across the ocean to the countries of the Old World.

Among all the great shipping ports for the export of grain, New York holds a commanding lead, as will be seen from the fact that, out of a total export from the United States of 155,107,091 bushels of wheat in 1896, the shipment from New York was 42,662,125 bushels, or over one-fourth of the whole. In the year 1892, when the crop was unusually heavy and the total export of wheat from all ports was 203,857,650 bushels, the export from New York was 75,363,965 bushels, or over one-third of the total. The cheapest route from the Western wheat farms to New York is by way of the Great Lakes and Buffalo. The wheat is hauled by the farmers direct from the thrashing machines to the small elevators which line the various railroads of the far West and form a conspicuous feature of the landscape. From these it is loaded into box cars and hauled to the great distributing points on the lakes, such as Chicago and Duluth. Here the bulk of it is transferred to steamers which have been specially built for the grain carrying trade. There are at present seven hundred vessels engaged in this trade on the Great Lakes. Those of later construction have a carrying capacity of over 100,000 bushels, and the largest of them is credited with a capacity of 180,000 bushels.

At Buffalo, which, by reason of its advantageous location, has grown to be one of the largest grain ports in the world, the wheat is stored in the mammoth elevators which line the harbor, and from these it is drawn off for shipment to the various Atlantic ports. From Buffalo the wheat is brought to New York either by rail or by the Erie Canal. In former years the wheat was brought to New York during the summer, chiefly by the canal, but latterly, and especially during the present year, the bulk of it has been shipped by rail. Statistics of the total amount of all cereals, wheat, corn, oats, barley, etc., brought to the New York market show that, out of a total of 150,827,120 bushels received in 1896 at this port, 78·07 per cent came in by rail and 21·93 per cent by water. Among the railroads, the Hudson River Railroad carried 22 per cent, the Erie Railroad 17·4 per cent, and the West Shore and the Lehigh Valley roads each carried about 14½ per cent. Of that which came by water, 0·37 per cent was brought down from points on the Hudson River or came in by coasting vessels, and 21·56 per cent was brought by the Erie Canal.

The wheat which eaches New York by rail is transferred to the great elevators at the terminals of the roads on the Jersey City side of the Hudson River. The train of cars is run through the center of the house, and elevators carry the wheat from the cars to the roof, where it is weighed (a carload at one weighing) and is run direct by conveyors and chutes into lighters which are moored in the docks alongside the building. These lighters will carry from 8,000 to 30,000 bushels apiece. The loaded lighters are then towed to their destination. If the wheat is to be stored, the lighters are taken over to the great Brooklyn warehouses, the largest of which, Dow's stores, is shown in the accompanying illustrations. If the wheat is to be shipped to Europe, the lighters are towed alongside the ocean steamer at whatever dock it may chance to be loading, and the wheat is transferred directly to the steamer's hold by means of what are known as floating elevators, of the type shown in Fig. 8. This is nothing more nor less than a steam vessel equipped with a complete elevator system, including weighing hoppers, screens, cleaners and elevator legs. The engine and boilers are placed in the stern of the boat and the elevator machinery amidships. In the elevator shown in Fig. 8 the latter is in duplicate, enabling the elevator to unload two lighters at a time. Extending from each side of the tower, and pivotally connected to it, is a leg containing an endless belt on which are fastened scoop buckets. The top pulley is driven by chain and sprocket gear from a vertical shaft within the tower. The legs are lowered into the hold of the lighter, and as the belt travels round the lower pulley its buckets scoop or "eat" up the grain, carrying it to the top of the legs, from which it falls through chutes into the weighing hoppers. If the grain is to be cleaned, it is carried up by a short bucket elevator and passed through a shaking screen, where the coarser foreign bodies are removed, as will be explanied later in the present article. From the screen it passes through the suction cleaning works, where all the chaff and finer refuse are removed. It then falls to the bottom of the "ship elevator," in the hold of the vessel, whence another endless bucket belt carries it to the top of the tower and empties it into long telescopic pipes through which it passes to the hold of the steamer. If the wheat is not to be cleaned, it is taken from the lighters and run directly to the foot of the ship elevators and discharged by them to the steamer.



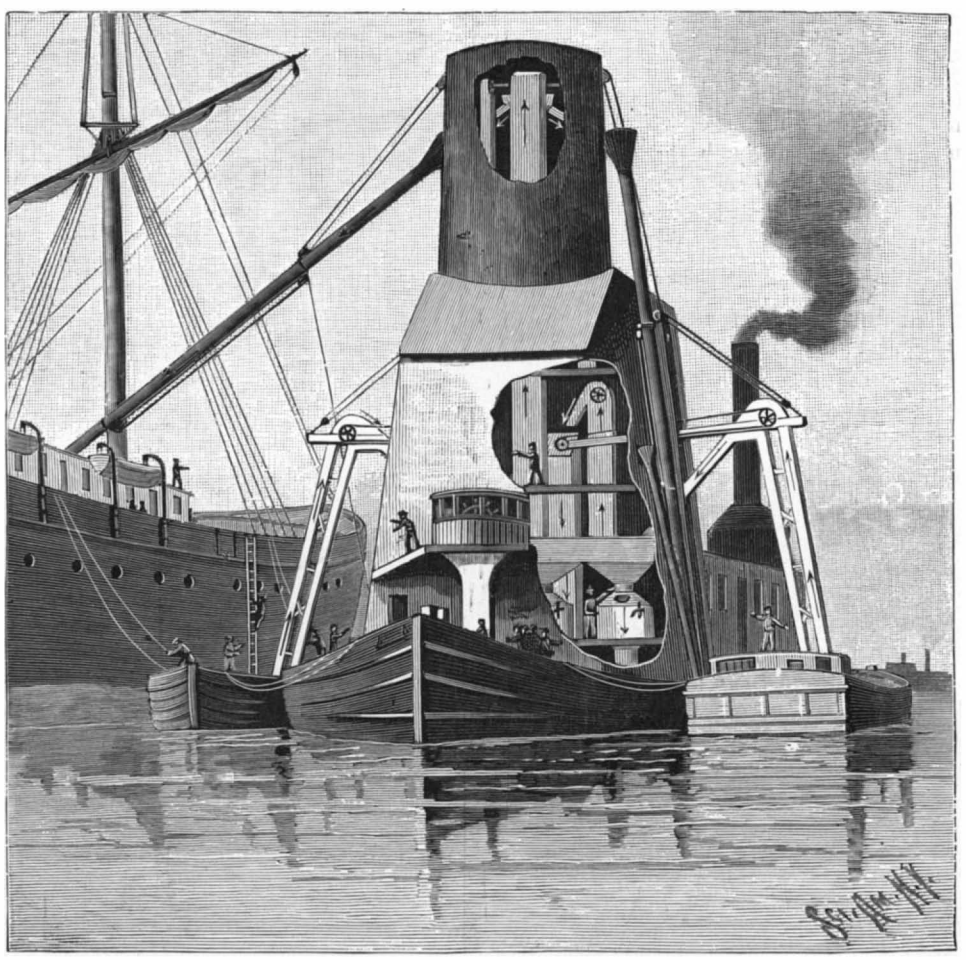
7.—GRAIN COOLERS.

The floating elevator has proved of incalculable value in reducing the time and cost of transshipping the grain; inasmuch as the deep sea craft do not require to be brought to the dock elevators, but may be loaded at any dock along the many miles of New York water front. The International Elevator Company, to whom we are indebted for assistance in the preparation of this article, possess seventeen of these elevators in all, six of which are of the double and eleven of the single type. The single elevators have a capacity of 6,000 bushels per hour, and as an instance of the rapid work that can be done by this system, it may be mentioned that two or three floating elevators working on each side of a great ship like the Pennsylvania could put 30,000 bushels per hour in her hold.

The wheat that is not shipped to Europe immediately upon arrival at New York is stored in one or other of the great elevators, the largest and most notable of which are at Dows' stores and Columbia stores, in Brooklyn, owned by the Brooklyn Wharf and Warehouse Company. The combined capacity of the two is about 3,500,000 bushels. Dows' stores, of which, by the courtesy of the company, we are enabled to give illustrations, is a vast structure, 100 feet in width, 1,200 feet long and 175 in height from the dock level to the top of the towers The main building at the inshore end is 100 feet in width by 600 feet long, with three great towers in which are contained the lofters (vertical elevators), weighing hoppers, cleaners, coolers, and a large system of inclined spouts for delivering the grain to the various storage bins.

In the main building below the towers are the storage bins. These are formed by dividing the space into a vast number of vertical cells or pockets, each 12 feet square by 52 feet deep, by means of wooden walls. The latter are built up of 2 inch plank, laid sidewise and spiked together, the lower half of the walls being 8 inches and the upper half 4½ thick. Each bin will hold 6,000 bushels, and if it were necessary over 2,200,000 bushels could be stored in this building at one time. Extending for 600 feet from the main building toward the river is an elevated gallery two stories in height carried upon trestle bents, and midway of its length is a seven storied building in which is a set of elevating and cleaning machinery similar to that in the towers above the main building. From each side of this building a large adjustable elevator leg projects over the edge of the adjoining dock.

It would be simply impossible to give within the limits of this article a detailed description of the operation of this great establishment, but it will be sufficient to trace the course of a ship load of wheat which has been brought to New York, let us suppose by canal boat, through the Erie Canal, and has been towed over to Brooklyn for storage in the warehouse. As soon as the boat has been made fast, the hatches are removed and the large elevator leg is lowered down until its mouth is buried in the heap of grain. The leg (see Fig. 2) consists of two approximately parallel square pipes, braced together to stiffen them, which serve to inclose an endless rubber and canvas belt on which buckets are attached at intervals of a foot. The belt passes over a pulley at each end of the leg, the upper pulley being inclosed except on the side nearest the building, where the casing opens into a chute leading to the inside of the house. The lower pulley is cased in on the sides but is open at the bottom, so that when the leg is lowered into the mass of wheat each bucket, as it passes round, scoops up a full load and carries it up the leg. The voracity of such an elevator is enormous, and when it is run at full capacity it will "eat up" 8,000 bushels in an hour. To accommodate the decreasing level of the wheat in the hold the leg is hung in a yoke which is raised and lowered by powerful hoisting gear in the house. This change in level necessitates the employment of the adjustable belt drive shown at the head of the leg (Fig. 2), where the



8.—FLOATING ELEVATOR TRANSFERRING GRAIN FROM TWO LIGHTERS.

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belt passes round two idlers and in over a pulley which operates the belt by means of a spur wheel and pinion.

From the top of the elevator leg the wheat is discharged into a large hopper above the scales. From this it is let fall by the operator into scales (Fig. 4), which weigh 160 bushels, or 9,600 pounds, at a time. This is done very expeditiously, only a brief interval being required from the time the lever, which opens the bottom valve of the hopper, is pulled to the time the scales are full. So expert are the operators that each 160 bushels is weighed with the greatest nicety. If the wheat has been previously cleaned, it is not cleaned at the stores, but is transferred at once to the bins. If it is to be cleaned, it is dropped from the weighing scales to the bottom of a short lofter or vertical elevator and carried up to the cleaning room. Here it falls upon the upper end of large inclined shaking screws, Fig. 3, where all the larger rubbish which may have become mixed with the wheat in transit is taken out. This rubbish consists of small sticks, twigs, leaves, fragments of coal, etc. The refuse passes over the screen and falls over the lower edge. The wheat falls into a vertical chute oblong in cross section, from the bottom of which it falls in a thin stream about ½ inch wide and 14 feet long. A strong current of air which is drawn across the stream of falling wheat by means of a fan serves to carry away all the dust, chaff, shriveled wheat cockles, weevils and finer rubbish which was not caught on the screens. The wheat now falls onto long belt conveyors which extend throughout the whole length of the building and are kept continually in motion. There are six lines of these belts in the gallery and six in the main store. They are made of fourply canvas and rubber and all of them are 30 inches in width. Their weight is carried on cylindrical rollers which extend the full width of the belt.

At the point where the wheat falls onto the belt the edges of the latter are turned up more acutely by a pair of rollers, one under each side. The object of this is to keep the stream of wheat from being scattered by the belt before its inertia is overcome. When the wheat reaches the long lofter by which it is to be taken to the top of the tower, it is discharged from the belt by a "tripper." This is a movable frame which runs on a track beneath the belt and carries two rollers, the upper one of which is a few feet above the level of the belt, the other being at the belt level. The belt rises with a gradual curve and passes over the upper roller and vertically down beneath the lower roller. The sudden change in direction of the belt causes the wheat to be thrown clear of the belt into a hopper, which leads it to the foot of a long lofter. The latter carries it to the top of the tower, where it is delivered into a hopper. From the hopper it falls by gravity to one of a number of universal distributing spouts, Fig. 5, situated just above the bins. This spout is swivel jointed and may be swung round to connect with any one of eight different spouts which lead to as many different bins, each spout carrying the number of the bin that it serves. So complete is this system that the wheat carried up by each lofter can be directed to any one of one hundred and fifty-two different stations. A part of the spouts will be noticed in the engraving, leading down from the towers through the roof of the main building.

It frequently happens that a body of grain becomes heated spontaneously, and means have to be taken to cool it to a normal temperature. It is at once drawn off from the bottom of the bin and carried by the belt conveyor to a lofter, by which it is taken up to one of the cooling rooms, which are situated in the towers above the main building. The cooler is built in units, any one of which consists of a deep and long, but narrow, box which reaches from floor to ceiling of the cooling room (Fig. 7) and is divided by two vertical partitions into three narrow compartments each 16 inches in width. The side walls and partitions consist of overlapping horizontal slats, which are arranged similarly to the slats of a Venetian blind and slope inwardly. On the outside of the slats is a wire screen. The top, bottom and ends of the cooler are closed and airtight, and the middle compartment is connected with a powerful fan. The heated grain is run into the two outer compartments, the fan is started and a strong current of cold air is drawn in through the wall of grain in each compartment until it has been cooled to normal temperature. The grain is then returned to its bin or loaded onto the steamer as desired.

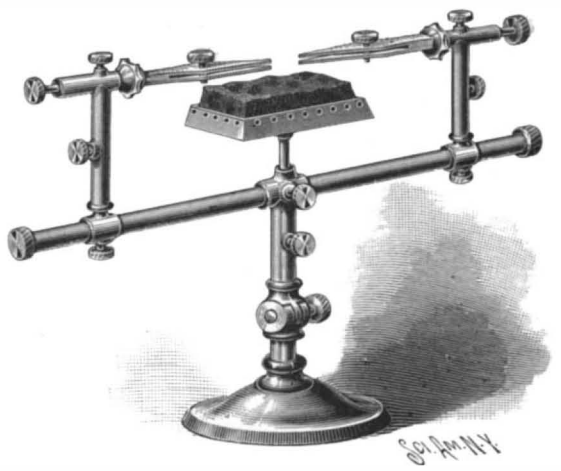
By reference to the large engraving of Dows' stores, it will be seen that at the level of the lower floor of the bridge gallery and at the middle height of the main building there is a long row of delivery spouts. There is a similar row on the other side of the building, and each of these may be used for transferring the grain to the ocean steamers. The wheat is drawn off at the bottom of the bins, carried by a short lofter to the conveyor belts, and by them transferred to the spout at which it is to be delivered. Here it is thrown off the main belt by a tripper, as already described, into a chute which delivers it to the spout leading to the hold of the steamer. When it is remembered that the building has 1,000 feet of wharfage front on each side of it, it can be seen that three or four large vessels could be loaded at once at these stores. It need scarcely be stated that such an establishment as this is capable of handling a vast amount of wheat in the year, the total having risen in some years to as high as 16,000,000 bushels.

Canadian North Pole Expedition.

Capt. Bernier, of Quebec, intends to try to make a trip to the North Pole, starting March 1, in the "Windward," which was used by the Jackson-Harmsworth expedition, from some point on the north coast of Siberia. He intends to take with him a geologist, a surgeon and five men. He expects to send the "Windward" back from Siberia after disembarking his outfit, as he intends to return to Spitzbergen, where supplies will await him. He will be provisioned for two and one-half years. He intends to travel at the rate of six miles a day, making the journey to the pole in 120 days. He expects to travel with dogs and reindeer, especially the latter, on account of their meat as well as their service. Information is not forthcoming as to how he proposes to feed his reindeer on the trip over the ice. Dogs have not been found to be extremely valuable adjuncts of a sledging journey over such ice as that which Dr. Nansen encountered. Reindeer would be far less serviceable than dogs. March seems to be a very early season for a start on an expedition of this kind, as there is little probability that Capt. Bernier could get through into the Kara Sea before early in the summer.

A UNIVERSALLY ADJUSTABLE JEWELER'S CLAMP.

To hold jewelry and similar articles while being operated upon, the clamp shown in the illustration, in connection with which is employed a charcoal pan or heating apparatus, has been invented and patented by Fred J. Thomas, of Cairo, Ill. Upon a suitable standard is pivoted a hollow pin, which may be rigidly held in any position by a set screw, and turning on the pin is a sleeve, also adjustable to desired position by a set



THOMAS' JEWELER'S CLAMP.

screw, while in the upper end of the sleeve is rigidly carried a horizontal beam, passing vertically through which and into the hollow pin is the stem of the charcoal pan, also held at the desired height by a set screw. At each end of the beam is an adjustable standard carrying an adjustable sleeve at the upper end of which is a horizontal head which receives a slidable rod with whose inner end is connected spring fingers projecting over the charcoal pan and adapted to hold the work in any desired position. The clamping portion of the device may, if desired, be removed from the standard and a horizontal arm adjusted thereon, to support a glue pot, etc., over an alcohol lamp, the device being adjustable to a great number of positions and having a great number of different uses.

Acetylene for Military Signaling.

In conjunction with Captain J. E. S. Moore, Mr. A. E. Munby has been making some experiments on the use of acetylene in signaling lamps, says The Progressive Age. They have obtained such good results with the very primitive apparatus at present employed, the light is so brilliant, and the requirements so portable that it seems well worth considering whether acetylene could not take the place of the lime light where portability is an object. From a communication by Mr. Munby we learn that the apparatus consists of a five-ounce bottle carrying a two-hole rubber cork. Water drips on to the carbide from a wide glass tube, holding some two and a half ounces, and furnished with a connection of rubber tube and a screw clamp to act as regulator. The gas escapes from a straight tube to the lamp, being trapped on the way by a wider piece of tube, into which the smaller tubes are corked at each end. This makes a sufficient condenser for any water vapor. The gas tube enters the lamp through the base, and the gas burns from an ordinary 0000 Bray. The generator, when charged, weighs one pound, and after a couple of minutes, during which time the action is a little irregular, will give a steady light for thirty or forty minutes. On more than one occasion, indeed, it has run out without the clamp being touched after first adjustment. He finds an ordinary lamp small for the heat produced, and has had to rivet the soldered parts; but increased ventilation would be easy to arrange. Of course, for permanent work, the generator would have to be arranged in metal. Even then it would probably be the lightest gas-supplying arrangement for the illumination yet produced.

Miscellaneous Notes and Receipts.

Wine from Leaves.—A French druggist has conceived the idea that the flavor of the fruits of shrubs and trees is generated in the flowers of these plants and passes from them into the fruits. The fragrance which the leaves of the black currant bush give off, especially after a little rubbing, and which is so very similar to the taste of the berry, has led the man to adopt this opinion. He goes further, and says that the pleasant taste of the apple, pear, or grape is prepared in the leaves of the respective plants, although he admits that it is hardly noticeable with these, and by far not in the same degree as with the black currant. But this does not discourage the inventor. He sees glycoside, which he proposes to decompose in sugar, or a more or less aromatic principle, as he sets forth in the Union Pharmaceutique. The respective leaves are to be crushed and a fermenting agent, such as yeast, is added to them, whereupon the odorless and tasteless glycoside decomposes and the chemical principle becomes free which is to impart to the fruit proper its aroma and pleasant taste. What was formerly sought to be accomplished with apples, pears, grapes, etc., is now done in a simpler manner with the leaves of these plants in the fermenting vat. Jacquemin, for this is the name of the inventor, places, e. g., apple tree leaves in water containing 15 per cent of sugar; then he adds the yeast. During the process of fermentation there is an odor of apples, and when the fermentation is finished and the yeast has settled, a straw yellow liquid is obtained which possesses the fine "bouquet" of the fruit of the respective trees from which the leaves were taken. With vine leaves the results are still more prolific. A beverage tasting and smelling strongly of wine is obtained, and finally brandy may be distilled from it which is similar to the best cognac!

Changing the Bed of the River Scheldt.—In Antwerp it is hoped that the plan long nourished in influential circles to connect the Rhine with the Scheldt by a canal may at last be realized. Such a new waterway would tend to increase international trade considerably. It is thought in Antwerp that a favorable moment has come to take the enterprise seriously in hand, because Kaiser Wilhelm is advocating the connection of all German rivers with the Rhine. The Belgian government and the city of Antwerp are now confronted with two projects from which to choose. One plan is to extend the harbor works and to broaden the present river bed. Another plan proposes to cut off the large angle which the Scheldt describes below Antwerp by a new bed, whereby the channel receives the proper breadth and necessary depth. This would do away with the north citadel, whose place would be taken by new harbor works.

Fixing Leather to Metal.—In order to fix leather to metal, the Maschinenbauer gives the following directions: Digest 1 part (weight) coarsely crushed gall nuts with 8 parts (weight) of distilled water about six hours and filter through linen. Then pour 1 part (weight) of cold water over 1 part (weight) glue, leave it stand for twenty-four hours and heat the whole, whereby a concentrated glue solution is obtained. Now coat the leather with the warm gall nut extract, bring the glue solution on the roughened and warmed metal, lay the leather on it, press it firmly, and allow to dry in the air. The leather will adhere so firmly to the metal that it cannot be separated without tearing it.

Manufacture of White Opaque Colors by the Use of Tungstates.—Those tungstates which are slightly soluble or insoluble in water and give no colored sulphides with hydrogen sulphide, preferably the tungstates of the earthy alkalies, are now employed in Germany as oil, size and water colors. Especially tungstate of lime and tungstate of zinc are recommended as white opaque pigments. The various tungstates of the same metal (e. g., calcium) behave alike and their quality as white opaque color is not affected by their different percentage of water. Tungstate of lime possesses the covering power of white lead, but remains white to sulphide of hydrogen and similar substances, while white lead turns brown. These tungstates can be used as size colors and water colors, another advantage over white lead.

Waterproof and Fireproof Wood.—In order to render wood waterproof and fireproof, the following "silicification" process is made use of according to the Gewerbe. The small boards are first laid into a waterglass solution of 5° to 10° Be. where they are left 10 to 12 hours, when they are taken out and allowed to drip off. After drying, they are placed in a solution (gravity 2° to 3° Bé.) of calcium chloride, magnesium chloride and ammonium chloride. In this they are left 4 to 6 hours, and after dripping off and drying again, they are ready for use.

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Correspondence.

AN URGENT PATENT OFFICE REFORM.

An Open Letter to the Hon. William McKinley, President, Washington, D. C.

MY DEAR SIR: As the time draws near when you will submit your annual message to Congress, allow me to suggest a subject under the caption "An Urgent Patent Office Reform," which should form a part of that message and which needs dwelling upon by yourself.

'Tis true that the regular report of the Commissioner of Patents will, as usual, cover the requisite ground; but as Congress has heretofore seen fit to ignore the needs and requirements of a service which has grown to such immense proportions that in every department of the Patent Office the employés are overcrowded to an extent inimical to health and detrimental to the good of the service, it is time some strong hand should support the recommendations made from time to time by the Commissioner of Patents and from time to time as often disregarded and ignored by Congress.

Coming, as you do, from the great manufacturing State of Ohio, you cannot but appreciate the influence of our patent service upon the business interests of the country; and anything looking to the betterment of that service redounds to the welfare, not only of inventor and manufacturer, but also to that much championed individual, the American workingman.

It is obviously evident from past experience that Congress has very little idea about either the working of the patent service or the great niche it fills in its relation to the outside world, employing, as it does, nearly seven-eighths of the entire capital engaged in manufacturing interests in the United States, or upward of six thousand millions of dollars, all based on patents; and if we are to learn anything from the past, that lesson seems to be that the future holds out little of encouragement toward the development by Congress of this service, whose crying needs have been so lightly passed over heretofore, unless some forceful influence is brought to bear in its support.

As you are doubtless aware, the yearly receipts of the Patent Office are $300,000 over and above its expenses, and it already has to its credit the enormous sum of $5,000,000.

In a letter to this journal, dated October 9, and published in its issue of the 23d ult., the writer called attention to the inconsistency in the present working of the Patent Office, which compels inventors to wait four months or more from the date of filing their applications before they come up for examination; and to excuse this delay either on the ground that the office is overworked or the force of examiners insufficient to cope with the vast amount of business pouring into that office daily, has no force in the light of the immense resources available to place the service upon a footing beyond criticism.

This journal, in its issue of the 6th inst., has an answer to my letter of the 9th ult., by one "E. A. H.," of Washington, who covers the ground exhaustively.

He writes that the Commissioner of Patents has no power or authority over a single penny of the receipts of the Patent Office, but that it is Congress who doles out with a niggardly hand just enough of revenue to keep the office from falling into innocuous desuetude, going so far as "specifying how much must be spent for each branch of the service, and even enumerating the entire office force to a man, prescribing their duties and salaries, and specifying the various amounts to be expended for supplies and other expenditures," entirely setting aside the suggestions and recommendations of the Commissioner.

So thoroughly and minutely does our Congress look after this most important of our government institutions that, according to our Washington friend, "the office is full of so-called laborers at laborers' pay doing the work of stenographers and skilled clerks, of messengers at messengers' pay doing the work of assistant examiners, while were it not for such expedients as these the office could not keep its head above water even as well as it does at the present time."

Now, Mr. President, as a man of sound common business sense, I ask you, wherein lies the justice of such procedure on the part of Congress? What right has Congress to deny to the patent service of this country that which is justly its due?

The directors of a bank might with equal justice refuse to cash the check of a depositor, because he had already withdrawn part of his deposit, as for Congress to steadily refuse to appropriate the necessary funds for the proper and expeditious transaction of the Patent Office business when the funds are already on hand for the purpose.

Here is an army of inventors pouring their fees into the Patent Office, and in return, what do they get? An impaired service, long and needless delays, working untold injury not only to themselves, but to the manufacturing interests of the country as well.

To quote again from the Washington correspondent: "Why should $300,000 per annum be collected from our inventors over and above the actual expenses of running the Patent Office, and then the appropriations for annual expenses be so cut down by Congress as to materially impair the service?

"Why are not our inventors justly entitled to as thorough and complete a preliminary examination and as valid a patent when issued as money, skill, and experience can afford, and which they would long since have had if the oft-repeated recommendations of practically every Commissioner who has held office for the last twenty years had received proper attention from Congress?

"Why should so large a portion of the building erected by the money of inventors, for the transaction of their business, be occupied by other non-supporting bureaus to the detriment of the service? Why should their models be crowded out of the building where they most naturally belong? Why should not the bureau be provided with a laboratory and scientific and law library, each fully equipped and in every way suited to its pressing needs? Why should not salaries be increased to be commensurate with services rendered?"

Our Washington friend asks, "Wherein does the remedy lie?" and answers for himself his own query, by saying, "Evidently in the halls of Congress." As this solution presents to him such a gloomy aspect he says: "I think, judging from the past, there will be no relief, or at least relief that is at all adequate, until the inventors and manufacturers of the country, one and all, take a personal interest in the matter, and use their personal influence with their senators and representatives in Congress, to see to it that in this matter simple justice is done them."

Mr. President, the inventors and manufacturers of this country want a better service; in fact, they demand a better service, and they back up their demand with the coin of the realm, which they have already paid for an inadequate service.

You, Mr. President, were elected to office by the people, and the people, of whom the writer is one, ask you in the name of justice and fair play to so present this matter in your forthcoming message to Congress that the report of the Commissioner of Patents will, when presented, have the consideration given it that it so well deserves, and that the needs of the patent service, as therein expressed, may be promptly met by the requisite appropriations; for no one, not even our worthy Congress, knows so well the needs of the service as does the Commissioner of Patents.

Respectfully, WILLIAM E. HEATH.

Baltimore, Md., November 9, 1897.

Parasites of the Fly.

To the Editor of the SCIENTIFIC AMERICAN:

Having seen no article in any of the periodicals upon the subject of which I am about to speak, and being anxious to know about the existence, distribution and classification of such insects, I mail to you, in a separate mailing tube, some specimens of this peculiar parasite which seems to have eluded our notice until within a few days.

At time of sending there are two of these lobster-like parasites attached to the fly's legs, in just the position they were when the fly was caught, about two hours ago. If you can tell me whether these parasites can subsist upon anything else than flies, from whence they come, and whether or not they are an apparently recent contribution of nature, I shall be very glad to be enlightened upon the subject through the columns of your valuable paper. C. T. PAGE.

Reply by L. O. Howard, Entomologist, United States Department of Agriculture.—The house flies sent by Mr. C. T. Page, of Chappaqua, N. Y., carried two species of arthropods attached to them. The first, a minute, scorpion-like creature, with enlarged palpi that look like the claws of a lobster, is one of the so-called "false scorpions," known as Chelanops oblongus, Say. These little false scorpions live in dusty places among books, in the cracks of the floor, under the bark of trees, and so on, and feed upon minute, soft-bodied insects, such as book lice and thrips. They are not true parasites on the house fly, but simply cling to the flies in order to be carried about. The second species is a small red mite which is a true parasite of the house fly. It is known as Ottonia muscarum. These fly mites are frequently found attached to different parts of the house fly and suck its blood. It is not likely, however, that they ever exist in sufficient numbers to seriously reduce the numbers of the house fly, and, in fact, they do not kill it soon, so that it will reproduce and live out a large portion of its allotted term of life before succumbing to the attacks of the mites.

IN the German gold and silver assay office, heating and smelting tests with acetylene gas were made recently, and are said to have resulted most satisfactorily. In a short time temperatures up to 1,500° Cent. were produced. A quantity of nickel was molten ready for casting within thirty minutes, while formerly it took from eighty to eighty-five minutes to melt the same quantity. A Bunsen burner, specially constructed for acetylene gas, furnished excellent results.

Science Notes.

The formula employed by the Magdeburg Steam Boiler Association is: (calories) = [8,000 C + 29,000 (H − O ÷ 8) + 2,500 S − 600 W] 0·01, in which the precentages of C, H, O, S and W (water) are those of the natural coals, i. e., in their original unchanged condition without being dried.

Omitting the persons on strike or engaged in the present great lock-out in Great Britain in the 113 trade unions making returns, with an aggregate membership of 462,292, 20,228—or 4·38 per cent—were reported as unemployed at the end of September, compared with 3·55 per cent at the end of August, and with 3·6 per cent in the 110 unions, with a membership of 434,886, from which returns were received for September, 1896.

Sig. G. Mattej has investigated the nature of the red spots which occur on the leaves, petals and other organs of many plants, species of Lysimachia, Oxalis, Hypericum, Myrsine, etc., and states that the pigment is composed essentially of a gum-resinous substance colored by a yellowish-red essential oil, its chemical constitution varying with the species. These spots are not, as a rule, found in the earliest stage of development of the organ, and are evidently the results of the transformation of leucites. They are often surrounded by a membrane, and are always embedded in the parenchyme, and are surrounded by ordinary cells.—Bull. Soc. Bot. Ital., 1897, p. 83.

Apropos of meteorites the following amusing story is told by Sir Robert Ball respecting one of these celestial visitors. A meteorite which fell on a farm in America was claimed by the ground landlord, as his lease reserved all minerals and metals. The tenant objected on the score that the article was not on the property when the lease was executed. The landlord then claimed it as flying game, but the lessee pleaded that the thing had neither feathers nor wings, and claimed it as ground game. But while the dispute was going on the customs officers seized the meteorite, on the ground that the revenue had been defrauded by its introduction into the country without payment of duty.

A dispatch to the Standard from Berlin says that M. Czernik, a Russian chemist, has examined two minerals found in the Caucasus which have apparently never before been analyzed. One of these minerals is a kind of coal ashes, from which M. Czernik obtained a considerable quantity of helium and a quantity of the rare earths which are employed in the manufacture of the mantles used in incandescent gas lighting. The other mineral is called cerite. It consists mainly of argon. M. Czernik's discovery is remarkable from the fact that the new elements helium and argon have never previously been found as minerals in a pure state, but always in combination with other elements.

With little doubt the longest-lived animal in the world is the giant tortoise of the Seychelles Islands. One has recently been presented to the Zoological Society of London, by Mr. Walter Rothschild, which weighs a quarter of a ton. Its known length of life is one hundred and fifty years, its age previous to its transportation to the island of Mauritius being unknown. In 1833 the governor of Mauritius sent to the zoological gardens a tortoise weighing 285 pounds. It was 4 feet 4 inches long, and had been in the island of Mauritius for sixty-seven years. The exact period was known; for this tortoise was brought to that island from the Seychelles in 1766. At that time it was full grown, so that its real age was probably much greater.

Herr H. Molisch has carried out a series of experiments on the influence of the chemical composition of the soil in changing the natural pink color of the flowers of Hydrangea hortensis to blue. He finds that this change is invariably brought about by the presence of alum in the soil; and that the efficient constituent in the alum is the aluminum sulphate, which has, by itself, the same effect as alum. Ferric sulphate produces a similar effect; while with other salts of iron the results were mostly negative. The blue color is due to a chemical combination of the salts in question with the anthocyan which is the cause of the natural pink color of the flowers. The filaments of the stamens are most sensitive to the change in color.—Bot. Zeitung, 1897, 1st Abth., Heft 3.

"The trail of the microbe is over them all," may well be written of every appliance that is to be found in the druggist's shop, or in even the best cared for sick room, says The Independent. The latest offender is the common rubber dropper for eye lotions. A dropper soon after being used becomes covered with a layer of bacteria, and they become coated with an insoluble white flourlike film. The lotion itself has probably been carefully sterilized, but the instant it touches the bulb the film comes off, and the insoluble particles are diffused through the liquid. When one reflects that the amount of contaminated liquid that Tyndall took up on a thread of spun glass was enough to infest a large test tube of sterilized material, and fill it with swarming microbes, we appreciate the force of thoroughly cleansing the dropper.

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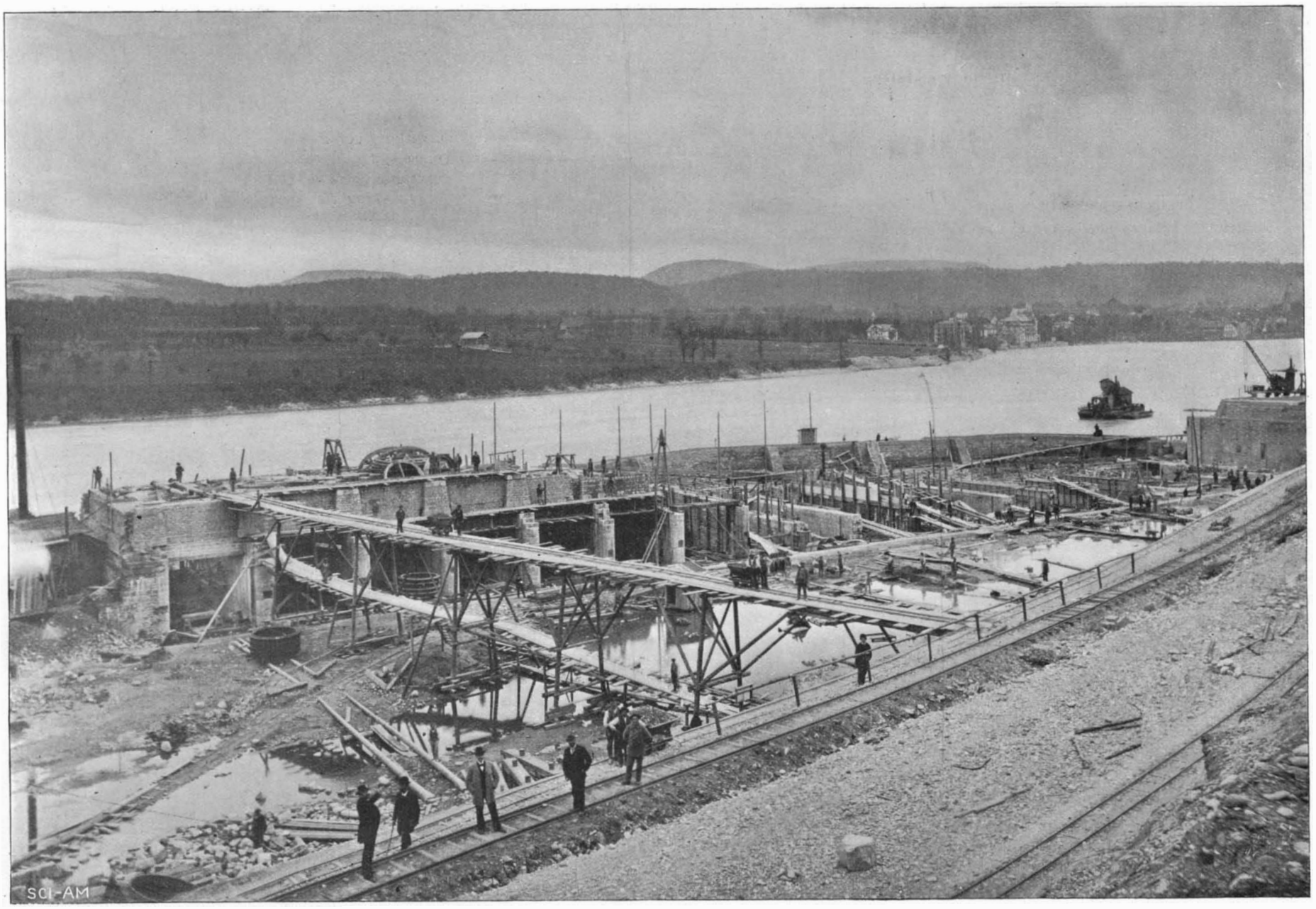

THE RHEINFELDEN ELECTRICAL POWER PLANT—THE CONSTRUCTION OF THE TURBINE CHAMBERS.

THE CONSTRUCTION OF THE POWER HOUSE OF THE RHEINFELDEN ELECTRICAL POWER PLANT—VIEW LOOKING UP THE HEAD RACE.

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THE GREAT ELECTRICAL POWER PLANT AT RHEINFELDEN ON THE RHINE.

Prominent among the rivers which present conditions favorable to the erection of electrical power plants is the Rhine, and particularly that part of it which extends from Reichenau to Basle, a distance of 154 miles, in which there is a total fall of 1,120 feet. At Schaffhausen, where there is a fall of 90 feet, the Neuhausen Aluminum Works are already established, and are using all the water that can be diverted from the falls without destroying their picturesque beauty. Below the confluence of the Aar and the Rhine there is a constant flow of 77,000 gallons per second, and this circumstance, coupled with the fact that the topography of the surrounding country is favorable to the location of factories, and that in a stretch of the river 1½ miles long, just above Rheinfelden, there are three rapids, with a mean fall of 23½ feet, determined the location of the great power plant which forms the subject of the present article.

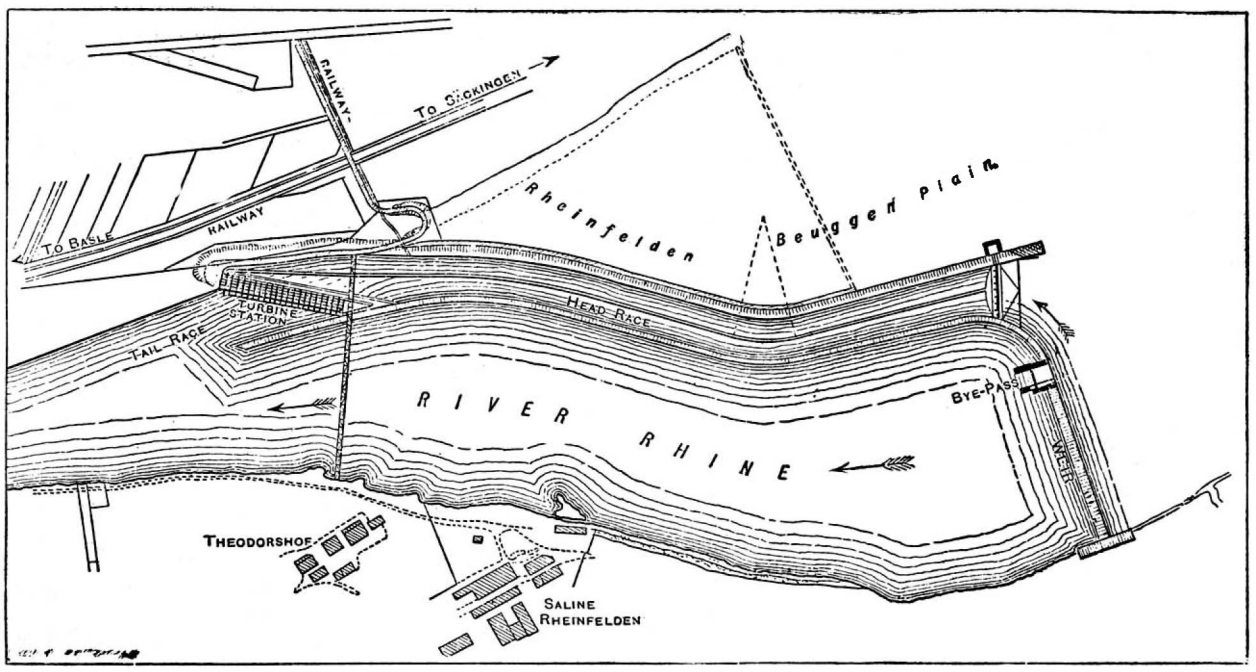


Fig. 1.—PLAN SHOWING LOCATION OF THE POWER STATION, THE DAM AND THE HEAD RACE.

It was originally proposed to utilize the whole low water head of 25 feet, and the first plans estimated that 11,000 horse power could be realized for an expenditure of $2,500,000. The plans were finally modified by Prof. Intze, of Aix-la-Chapelle, and it was decided to use a head of only 16 feet, thereby confining the construction to about 1,100 yards of the river. It was estimated that, to secure 15,000 horse power, the cost of turbines and buildings alone, exclusive of the electrical equipment, would be $1,115,000. The contract was let to Escher, Wyss & Company, of Zurich, and Zschokke & Company, of Aarau, Prof. C. Zschokke taking charge of the work under the superintendence of Prof. Intze. The electrical plant was built by the Allgemeine Elektricitäts Gesellschaft and the Oerlikon Works, to the former of which we are indebted for our illustrations and particulars.

The plan of the works, Fig. 1, shows the location of the dam, which is built clear across the river and contains a sluiceway 65 feet in width, the head race which leads the water to the turbines and the power house. The crown of the dam is 6½ feet broad, and while the back of it has a steep angle, the face slopes gently to the bed of the river. The head race is 170 feet wide, the wall on the river side being 23 feet high, 5 feet broad at the top and 13 feet at the base. The entrance to the head race is protected by screens to keep out rocks, bowlders and rubbish. Here also are located the gates which regulate the flow of water. The sides of the head race are lined with brick and cement. A sluiceway, 20 feet wide, is provided on the right hand side of the turbines for letting out the ice from the front of the screens in winter time.

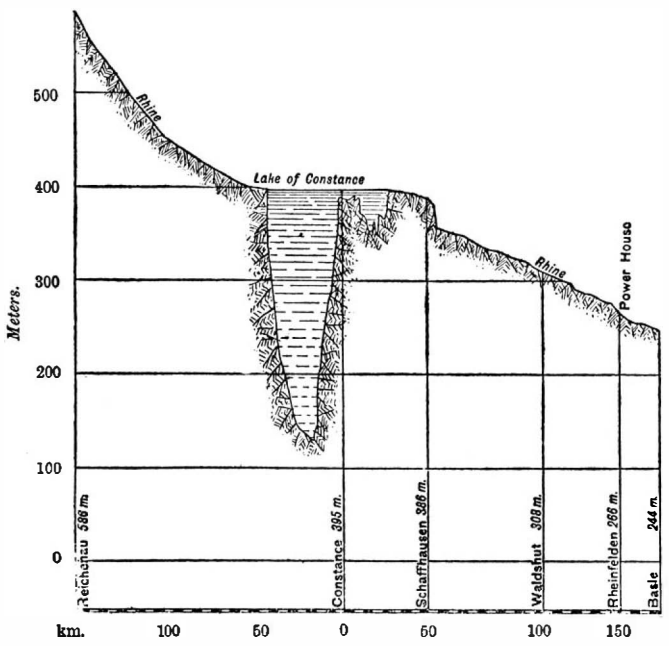
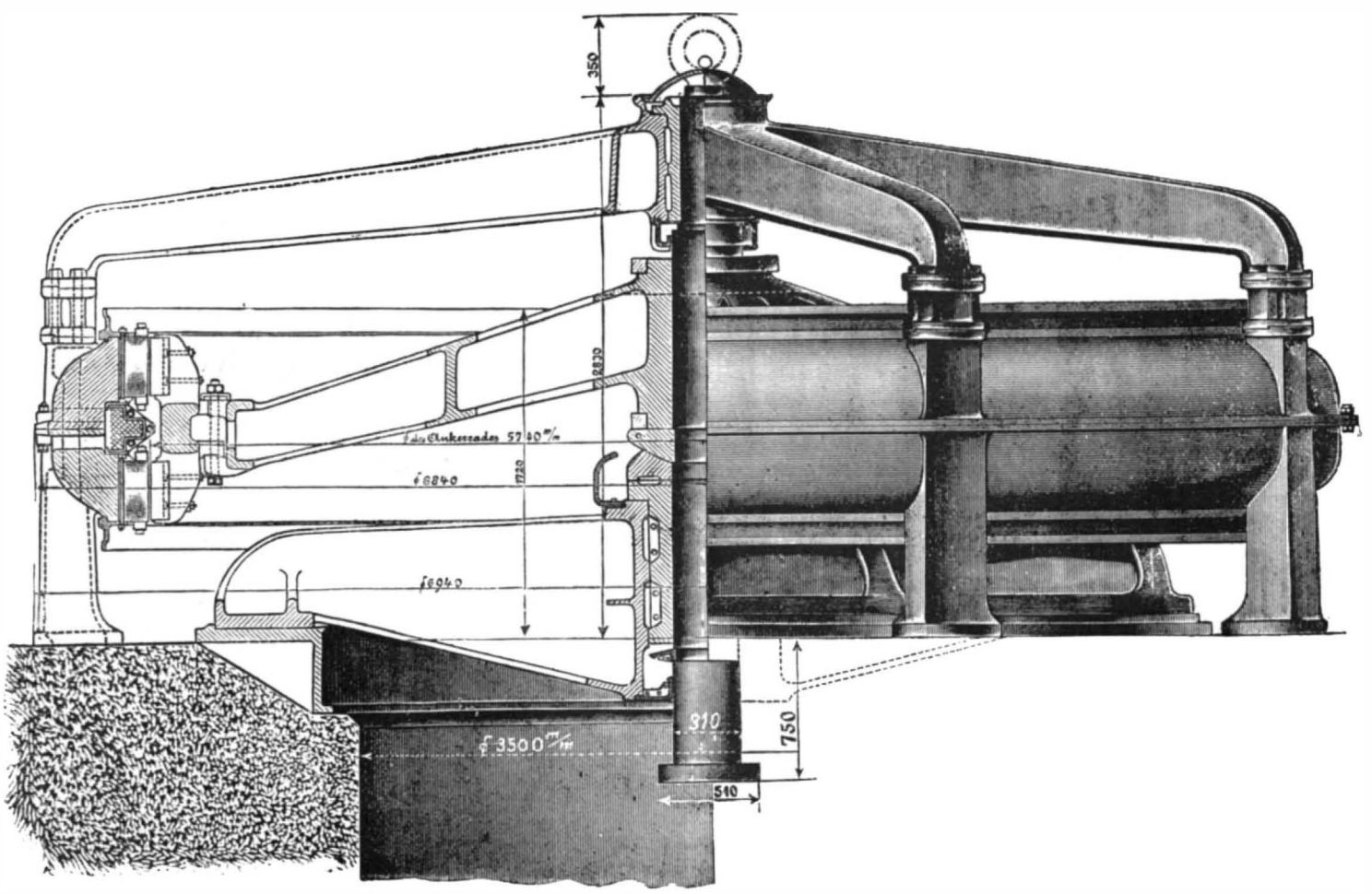


Fig. 2.—PROFILE OF THE RHINE FROM REICHENAU TO BASLE.

The power house has twenty chambers, though only ten of the 840 horse power turbines are at present installed. The chambers measure 18 feet by 33 feet by 49 feet high. The partition walls are 4 feet in thickness. Each chamber is supplied with a balance gate 9 feet wide by 16 feet high for shutting off the water. These gates are moved by a handwheel in the dynamo room, which is situated above the turbine chambers. The gates were built to withstand a pressure of 70 tons. When repairs are necessary, bulkheads will be put in above and below the turbines and the water will be drawn off by electrically driven pumps.

As a result of the large quantity of water, 3,740 to 5,500 gallons per second, which passes through each turbine, they all had to be built with a large diameter and to operate at a slow speed of revolution. It was decided to run the turbines at 55 revolutions per minute, and the design adopted was the Francis reaction turbine, with two turbine wheels superimposed. The wheels, Fig. 6, which are 7 feet 8½ inches in diameter and 4 feet 1 inch high, have each 32 vanes, and the guide frames have each 36 blades, the distance between centers of the wheels being 11 feet.

The lowest guide frame, which rests on a bearing ring cast into concrete, conducts the outflow of the lower half of the turbine to the tail race. A wrought iron receiver rests upon this guide frame and receives the outflow of the upper half of the lower turbine and the lower half of the upper turbine and conducts it into the tail race. Another wrought iron receiver on the upper guide frame leads away the outflow from the upper guide frame. Both wheels are carried on a 12 inch shaft, which is held by three 24 inch bearings of lignum vitæ, which is particularly suitable, on account of its hardness and the large percentage of resin which it contains, for bearings of this kind. The turbines are direct connected to the dynamos by means of a vertical shaft, which is a continuation of the turbine shaft. This works in a metal bearing carried on a cross framework. Regulation is effected by cylinder gates in the lower turbine by means of a four-part gate and in the upper turbine by two independent double gates. When there is a high head of water, the lower turbine is sufficient to supply the necessary power and the upper turbine is entirely cut off. As the water of the river rises, decreasing the head, the lower pair of valve chambers is opened first and then the upper pair



THE RHEINFELDEN ELECTRICAL POWER PLANT.—Fig. 3.—ONE OF THE GENERATORS.

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The three-phase alternating current system of transmission was adopted, as this was considered to be the most economical for this plant. At present it will be operated at a potential of 6,800 volts, but ultimately, as the demand increases, the voltage will be raised to 16,500. The generators, Fig. 3, are of the inductor type, with stationary armatures and rotating pole pieces. They consist of two stationary armature rings which are connected both mechanically and magnetically by the outside cover or frame. The rings are built up of laminated plates and carry the coils by means of projecting teeth. The inductor ring is cast in sections and bolted to a massive spider which is keyed on the main shaft. Fifty-five pole pieces of a general yoke shape are carried upon the periphery of the ring.

The generators rest on a floor of concrete immediately above the water tanks of the turbine. The generator shaft, as already mentioned, is connected to the turbine shaft by means of a flange coupling which is welded on the inductor wheel, being keyed to a boss near the center of the shaft. The great size of the generator may be judged from the fact that the outer cast iron frame is 22 feet 5 inches in diameter. It consists of four separate castings, each of which has two standards or feet which rest directly upon the cement floor of the engine room. The frame is divided horizontally into two parts which are bolted together.

The turbine wheels on the lower part of the shaft weigh altogether thirty-five tons and the inductor wheel and the upper shaft weigh twenty tons, making a total of fifty-five tons in all. This, of course, necessitates a very solid support. It consists of two semicircular castings and is 15 feet in diameter. Its outer edge is carried by an annular bed plate let into a cement foundation on the concrete floor. To save the great waste of power due to the friction of this load, oil is pumped into the bearing under pressure of 350 pounds to the square inch. The oil, which is forced to the inside, runs through the vertical bearing and keeps it clean. That which is forced outwardly is collected for use again. The normal output of each dynamo is about 720 killowatts and the efficiency is calculated at 92 per cent. The machines are excited by three 150 horse power rotary transformers. Transformers are also used for lighting the power house and the surrounding grounds. Five of the generators will be set aside for lighting and the other fifteen are intended for power and for electrochemical works. The poles for the high pressure feeder are shown in Fig. 7. The insulators are built to withstand a working pressure of 16,500 volts. The three large insulators on one side of the pole are for the lighting mains and the three on the other side for the power mains. The mains are of bare copper, and silicium bronze wires of smaller diameter will be used for the telephone wires and testing wires, which are placed below the guard nets shown by dotted lines in the figure. Charge for current for lighting purposes will be about ten cents as a maximum per unit, with a scale of discount varying from 5 per cent, if the average demand extends over 500 hours, to 80 per cent if it extends over 6,000 hours per year.

It is hoped that the construction of this fine plant will transform the district of the Upper Rhine into a manufacturing center of considerable note. The company has acquired considerable tracts of land on both the Baden and Swiss sides, which it is hoped will in time be utilized for the erection of manufacturing plants.

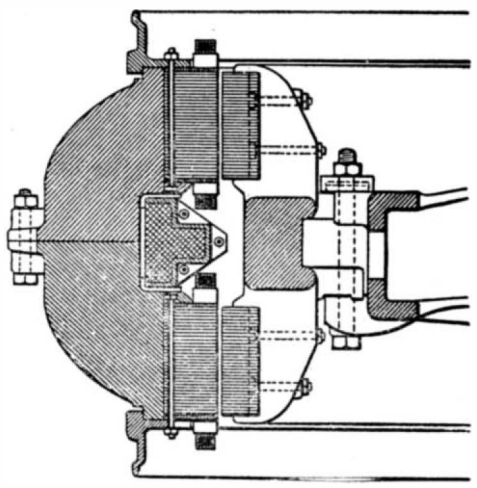

Fig. 5.—DETAILS OF THE GENERATOR.

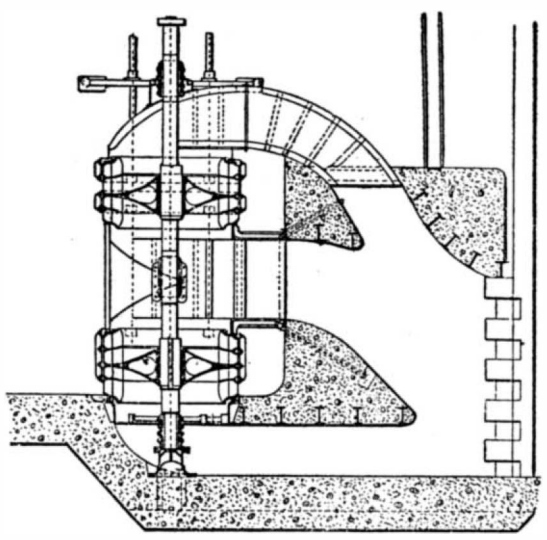

Fig. 6.—THE ARRANGEMENT OF THE TURBINES.

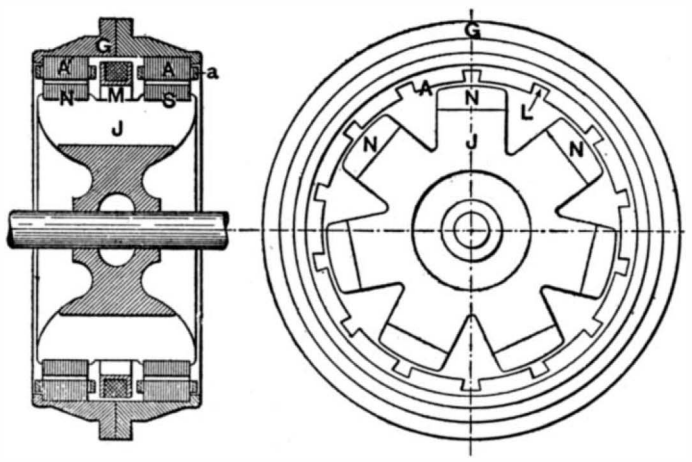

Fig. 7.—DIAGRAM OF THREE-PHASE GENERATOR.

Arctic Life in Glacial Times.

Recent critical studies on the fossil fauna and flora of the Arctic regions tend to make one hesitate in accepting the conclusions of Heer that the climate of the polar regions was tropical up to the time of the glacial period. Mr. J. W. Gregory, in Nature, brings together testimony which goes to show that the vegetation and animal life has always, from the earliest geological times, not been tropical, and that the earth's climate, even from the beginning, was not entirely uniform. Nathorst, on examining Heer's type specimens from the tertiary Disco beds of West Greenland, finds that his conclusions, as stated in every geological text book, were "based upon specimens too fragmentary to be of any value," and that half of the genera and species must be suppressed. Thus no palms, the plant most indicative of a tropical flora, occur; but big leaved trees whose leaves resemble those of the plane, maple, and lime did occur; but botanists distrust the evidence of leaves alone. Robert Brown examined the plant beds at Disco and found that in no case were the leaves attached to the stems, and quoted and apparently approved Steenstrup's remark, that "perhaps they (the leaves) were blown by the wind to their present locality." So Brown, says Nature, saw no evidence that the West Greenland plant beds mark the site of ancient forests. Gregory then goes on to suggest that the Disco deposits might have been drifted from warmer regions. He claims that the quantity of driftwood cast upon the Arctic shores is "enormous." Many raised beaches are strewn with pine and larch logs. Most of the Arctic driftwood consists of logs of pine and larch from the Siberian forests, but blocks of mahogany from Central America sometimes occur, and West Indian beams are not uncommon. However this may be, the evidence brought out by Heer strongly leads us to suppose that the tertiary vegetation of Greenland, if not tropical, was probably temperate, like that of the Middle States and California. Fossil coral reefs have also been asserted to have existed in Silurian and Carboniferous times in the Arctic regions, but in reality, says The Independent, no true reef builders exist there; and at the present time isolated cup corals are still living in the polar seas, at considerable depths. Gregory then concludes, on examining the evidence derived from our knowledge of six fossil faunæ from the Silurian to the Cretaceous, that: 1, They are often rich in individuals but poor in species; 2, crustacea, trilobites, polyps, etc., are proportionately common and often large in size; 3, compound corals are scarce, and occur in nodules instead of in reef building masses; 4, sea urchins and sea lilies are extremely scarce; 5, there is a striking poverty in new or special types. These are, in the main, the characteristics of the existing Arctic fauna, and it seems reasonable to conclude that all through geological time the polar flora and fauna have been more barren than those elsewhere. In Jurassic times there were probably climatic zones, which appear to have been parallel to the equator as now; so in tertiary times—for from whatever direction we approach the pole, the fossil floras "become sparser and more boreal in aspect, as we may see by a comparison of the plants of Disco Island and Grinnell Land, of the Great Slave Lake and Prince Patrick Land, of Iceland and Spitzbergen, and of Saghalien and New Siberia."

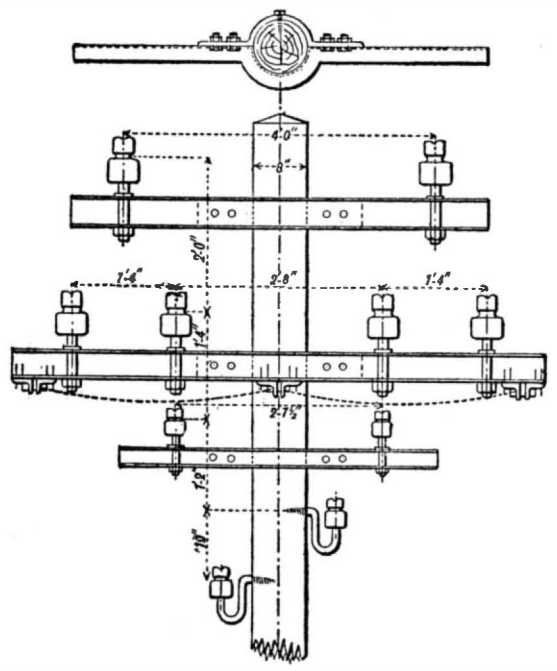

Fig. 4.—POLES FOR THE ELECTRIC TRANSMISSION.

LIGHT DRAUGHT GUNBOATS FOR THE NILE EXPEDITION.

In view of the military expedition which the British government is conducting in the Upper Nile country, the illustration which is herewith presented of one of the new gunboats which have been built for river service above the cataracts will possess special interest. These vessels, which have been constructed by Messrs. Yarrow & Company, of London, who have kindly furnished the photograph and particulars, are 145 feet in length by 24 feet 6 inches beam. The hull proper is 6 feet deep, and carries a superstructure, as shown in the illustration. The draught is 2 feet when carrying a load of 35 tons. The hull is built in eleven floatable sections, which can be easily put together while afloat, thereby avoiding the difficulties and delays incidental to riveting together and launching, and also avoiding the necessity for a large number of skilled hands. The machinery consists of two pairs of compound surface condensing engines, supplied with steam by two Yarrow straight-tube water tube boilers. The vessels are propelled by twin screws. The speed on trial was between thirteen and fourteen miles an hour.

The design illustrated was got out at the request of the Egyptian government by Sir William White, and it will be seen that it embodies a thoughtful and well matured scheme It will be within the recollection of our readers that Messrs. Yarrow & Company, about ten years ago, built a number of shallow draught stern wheel gunboats for the Nile expedition under the command of Lord Wolseley. These vessels proved very successful at the time and still more so during last year, when they took a leading part in the advance toward Khartoum.

The boats used in the former expedition were stern wheelers, but it has been determined by the advisers of the Egyptian government that vessels capable of carrying guns of greater power at a higher level would be desirable. It was decided, therefore, that stern wheelers were not desirable if any other means of propulsion equally efficient could be devised, because in the case of stern wheel machinery the engine room and stokehold staff, as well as the boiler and engines, are necessarily much exposed. It was also essential that the vessels should be capable of being shipped to Egypt and transported by rail to the Upper Nile; and moreover, to avoid the delay and difficulties incidental to riveting up and launching, it was determined to have the sections floatable, as the risk of passing the cataracts if the vessels went out whole would be altogether prohibitory. This system of construction in floatable sections was first introduced by Messrs. Yarrow in a stern wheeler built by them for the King of the Belgians for the navigation of the Congo.

In order to get the desired result as regards propulsion, it was evident that ordinary screws would not be advisable, and Messrs. Yarrow & Company had recourse to a device which they have adopted for some years with great success. In the bottom of the boat, near the stern, two tunnels are raised, and in each of these one of the twin screw propellers revolves. These propellers are of very special design. The upper part of the tunnel is as much as 2 feet 6 inches above the waterline. The working of the screws drives any air that may be present out of the tunnels and its place is immediately taken by water. As the space within the tunnels above the waterline is wholly shut off from the surrounding atmosphere, the water itself, as it were, seals this airtight compartment, and the tunnel remains full of water, just in the same way that a siphon, when once filled, does not empty itself. The screws, therefore, are wholly immersed. On trial the speed was found to be a trifle over 13 miles an hour and the draught of water 1 foot 11½ inches.

One important point in this system of propulsion is

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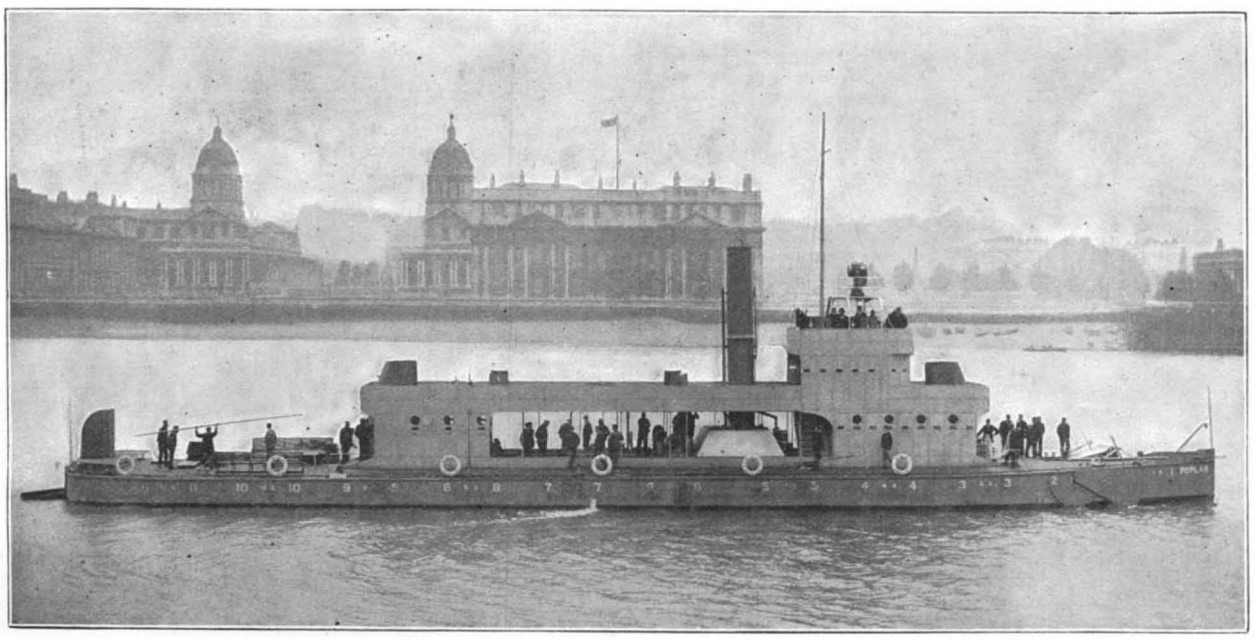
that it offers exceptional advantages for going astern, or what is the same thing, stopping headway; in fact, on the trial it was found that from full speed ahead to a state of rest the vessel would only travel about two lengths. This power of going astern is of the utmost value when navigating rivers which are shallow, the beds of which are continually changing, because on going down stream it is clearly necessary, on approaching a shallow, to stop the progress of the vessel as quickly as possible.

The superstructure, which forms the fighting and inhabited part, is well shown in the illustration. A distinctive feature about these boats is the fitting of leeboards in the fore part, the object of which is to take the place of "deadwood," which is necessarily absent in a flat-bottomed craft drawing only two feet of water. These leeboards perform exactly the same function as leeboards do in a Thames barge by offering lateral resistance, which prevents the vessel blowing off to leeward. Light high-sided vessels are extremely difficult to handle when there is a side wind; and it is to render them easily handled and maneuvered when a side wind is blowing that these leeboards are required. It may be added, however, that the steering when going ahead is so rapid that leeboards under these conditions need not be used; it is only when going astern that they are required. The steering is arranged by means of three rudders worked by steam steering gear.



LIGHT DRAUGHT GUNBOAT FOR THE NILE MILITARY EXPEDITION.

The superstructure consists of two deck houses as shown. These are connected by a flying bridge, 38 feet long by 13 feet wide, while above this is a bridge deck, 14 feet long by 13 feet wide, and above this again is a platform on which is fixed a search light. The deck houses and the central portion of the vessel are made of chrome steel, and the parts surrounding the boiler and engine are of such a thickness as to be proof against the Lee-Metford bullets at 20 yards point blank. The bulwarks of the flying deck also are of the same material, and it will be seen that the cabin sides are loopholed for rifle fire.

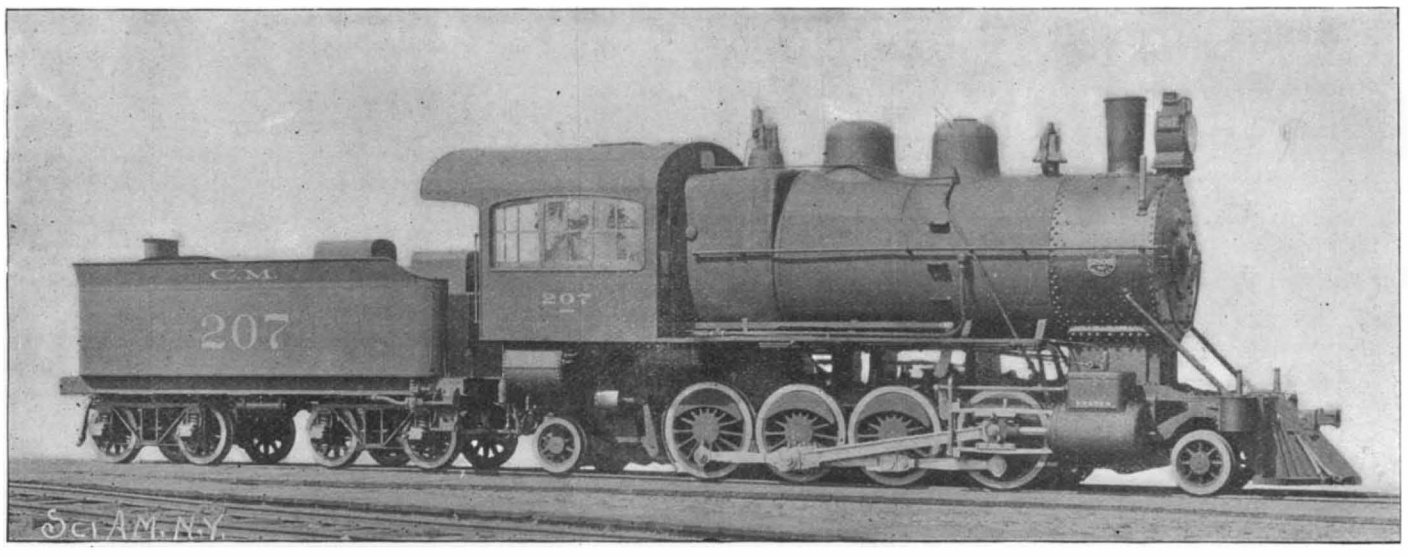
The armament consists of two 12 pounder quick firing guns, placed at each end of the flying deck, the bulwarks being hinged so as to fold down at the ends to form an extension of the platform when the guns are brought into use. On the flying deck also are four automatic Maxim guns, two on each side. Four similar guns are placed in the upper battery or bridge deck, and these are 21 feet above waterline, at which level it is anticipated that these guns will have perfect range over the banks on each side of the Nile.

It is worthy of remark that the arrangement of propellers adopted by Messrs. Yarrow & Company offers a considerable advantage in the fact that the screws can be taken off and replaced while the vessel is afloat. This is effected by means of a movable cover, which is placed on the top of the tunnel, immediately over the propeller itself. By opening this the water in the tunnel at once falls to the general water level surrounding the vessel, and the screw is, consequently, more than half out of the water. The propellers are not likely to get damaged, because they do not work below the bottom of the boat, and are surrounded on all sides by the hull itself. At the same time, it is an immense advantage, if they do get damaged or fouled by any means, that they can be at once got at. As a matter of fact, on a trial made specially to test the time occupied in removing the propeller and replacing it by another, it was found that it could be readily done in eight minutes.

The name of the vessel is now the "Sultan," but she was originally known as the "Poplar." She has already been sent out to the Nile and is probably by this time half-way between Cairo and Abu Hammed, where she is to be put together. A second vessel of the same type is on the point of being dispatched from England, and her erection, it is contemplated, will follow immediately after that of the "Sultan." It may be added that these vessels are calculated to be able to carry, on an emergency, 1,000 troops. There is little doubt that before long we shall hear of the part that these vessels will play in the operations on the Upper Nile in the expedition against the Madhi.

MOUNTAIN FREIGHT LOCOMOTIVE FOR THE MEXICAN CENTRAL RAILWAY.

The accompanying engraving represents the latest and in some respects the largest of those enormous freight locomotives which are being turned out in increasing numbers by American locomotive builders. The tendency in all branches of industry toward concentration, not merely in the vast manufacturing establishments, but in the objects of manufacture themselves, is very marked. In the great field of transportation we see it exemplified in such enormous ships as the Pennsylvania, the Kaiser Wilhelm, and the Oceanic, shortly to be launched, and on land the same tendency is seen in such powerful machines as the mountain locomotives of the Northern Pacific, recently illustrated in this journal, and in the locomotive which forms the subject of this article. The economy of these engines, whose hauling power is fully double that of the locomotives of fifteen or twenty years ago, lies in the fact that they will haul double the amount of freight with the same train crew, besides encumbering the too often overtaxed freight lines less than would two separate trains. Moreover, now that roadbed, rails, and bridges have been brought up to such a high state of efficiency, there is no more wear and tear of the road than there was in the days of lighter rolling stock.



POWERFUL MOUNTAIN FREIGHT LOCOMOTIVE FOR THE MEXICAN CENTRAL RAILROAD.

Cylinders, 21 in. diameter by 26 in. stroke; heating surface, 2,803 sq. ft.; steam pressure, 180 pounds; weight, 193,450 pounds.

The engine was designed by Mr. F. W. Johnstone, superintendent of motive power on the Mexican Central Railroad, and has just been completed by the Brooks Locomotive Works, of Dunkirk, N. Y. It is of course exceeded in power and size by the great Johnstone double bogie compounds built in 1892 for the same road, but as these were practically two locomotives combined in one, they constitute a class by themselves. The total weight of the engine in working order is 193,450 pounds. Of this, 145,200 pounds is on the drivers, 23,450 pounds on the front truck and 24,800 pounds on the rear truck. The engine measures 36 feet 6¾ inches over all, and the total length of tender and engine over all is 61 feet 4¼ inches. The boiler is of the Belpaire type and carries a steam pressure of 180 pounds to the square inch. The firebox, which is carried above the frames, is of steel; it measures 3 feet 2½ inches in width by 10 feet 1 inch in length, and the grate area is 31·45 square feet. In diameter the boiler is probably the largest ever carried by a locomotive, the first course measuring 78 inches and the smokebox 81 inches. It contains 412 two inch tubes whose aggregate heating surface is 2,585 square feet. This added to the 218 square feet of surface in the firebox gives a total of 2,803 square feet for the boiler.

The cab and the running boards are of steel, the former being of an exceptionally neat design, with large side windows. Special attention has been given to the internal fittings of the cab, with a view to placing them conveniently within reach of the engineer and fireman.

The cylinder cock lever is just in front of the engineer, near the floor, while the brake valve and air signal whistle are attached to the right side of the cab. The reversing lever is to the left, and just above it, on the boiler, are the levers which operate the sand box, whistle and throttle valve. A whistle lever is also mounted on the fireman's side of the cab. The steam and air gages face the engineer, while the fireman's steam gage is at the center of the boiler head.

The cylinders are 21 inches diameter by 26 inches stroke, and the driving wheels are 49 inches in diameter. The rigid wheel base is 13 feet and the engine wheel base 28 feet. The shortness of the rigid base was necessary to enable the engine to travel round the many sharp curves of the mountain roads, several of which are as high as 18°. It is expected that it will haul a train of 210 tons weight up a 3 per cent grade 30 miles in length, and it is on this grade that the 18° curves occur. When we bear in mind that the total weight of train and engine will be 355 tons, it will be realized that this will be a great performance.

A NEW PACIFIC STEAMSHIP COMPANY.—The States Steamship Company was chartered under the laws of the State of New Jersey, November 11, with $7,000,000 capital and Charles H. Cramp as president. The company acquires from the International Navigation Company five steamers—Pennsylvania, Ohio, Indiana, Illinois and Conemaugh. They will place them in service between Seattle and Alaskan ports. The Ohio will sail from Philadelphia for Pacific ports. The steamers are due at Seattle by March 1.

BEAUTIFUL black chalk is obtained by mixing ordinary chalk with a suitable quantity of a decoction of logwood to which either green vitriol solution or chromate of potassium is added. By means of either of these substances logwood extract becomes black. The chalk is intimately incorporated with this black solution and from the doughy mass pencils are formed, which are ready for use after drying.

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RECENTLY PATENTED INVENTIONS.

Engineering.

ROTARY ENGINE.—Matthew H. Beyer, Orange, N. J. This engine has a series of cylinders connected with each other and turning around a central drum which is provided with inlet and outlet ports. The pistons of the cylinders have rods with rollers on their ends, and these rollers work against stationary cammed surfaces, so that the reaction between said surfaces and the piston rods causes the cylinders to be turned continuously around the drum. From a pulley on the cylinders motive power may be taken. The cylinders may be combined in any number, so as to make a double, triple or quadruple expansion engine, it being understood that the steam is led successively to the pistons, so that the principle of action is the same as in all compound engines.

Railway Appliances.

CAR FENDER.—Ronald A. Stuart, New York City. When the fender of a street railway car is rigidly connected with the car body, the front end of the fender moves up and down with the rocking of the car, a difficulty which this invention is designed to obviate, as it provides for maintaining the fender at a practically uniform distance above the track. Mounted to swing on the lower side of the car platform is a yoke whose forwardly extending arms are pivoted to lugs, and to these arms are secured curved side arms to which are attached the side members of the fender frame, while pivotally connected to the yoke is a rearwardly extending lever fulcrumed to studs depending from the bottom of the car immediately forward of the axle. This arrangement causes the fender to yield with the rocking motion of the car, and the fender has an auxiliary front portion which swings up to form a pocket when a body is struck by and is received upon the fender.

CAR AND LOCOMOTIVE BALL BEARING.—James Naismith, Kearney, Neb. The box of this bearing is adapted to slide vertically in the truck jaws, and is arranged for engagement by the equalizing bar of the truck, a sleeve secured to the axle extending loosely within the box, and balls being interposed between the box and sleeve in a race formed by an external recess in the sleeve and an internal recess in the box, the race being wider than the diameter of the balls. By this arrangement the axle has free play laterally and up and down, to permit it to assume an angular position relative to the box when the car passes around curves, without danger of binding or gripping the axle or the balls in the race. Caps on the top and bottom of the box prevent the entrance of dust.

Bicycles, Etc.

BICYCLE SADDLE.—William H. Kelley, New York City. This saddle has a base with a front or pommel end connected by a hinge with the pommel end of a top plate extending rearwardly and upwardly, the top plate beingmounted to swing toward and from the base. The cantle end of the top plate has at its under side sockets engaged by the upper rounded ends of pins extending through openings in the base, there being on each of the pins a coiled spring resting on the top of the base, the tension of the spring being readily regulated to press the under side of the top plate with more or less force, according to the weight of the rider, insuring easy riding without chafing the legs, while affording a large, firm seat at the cantle end of the saddle.

Mechanical.

BELT TIGHTENER.—Solomon R. Forbess, Randolph, Tenn. A belt clamp that may be used on a narrow or a wide belt with equal facility, and upon one located close to a wall, is provided by this invention, the clamp not placing the belt under injurious strain, while it may be used to lace the belt while the latter is on its pulleys. The tightener consists of clasps arranged in pairs, each clasp comprising two hinge-connected members through which are passed tightening devices, while turnbuckles connect corresponding clasps of each pair, the body portion of the turnbuckles being in adjustable sections.

TIRE HOLDER FOR FORGES.—James B. Farrar, Wilmington, N. C. To hold tires while they are being heated in a forge fire this invention provides a machine having an expansible head or holder for the tire, adapted to be readily clamped in place, the holder being so supported that it may be turned to expose every portion of the tire to the heat, while the shaft carrying the holder may be adjusted vertically to set tires of different diameters in proper relation to the forge fire.

Agricultural.

CHECK ROW PLANTER.—Edward S. Roseberry and William H. Fickel, Hurdland, Mo. This planter has suspended wire-carrying pulleys arranged beneath it, while swiveled to the rear end of the planter frame is a guide bar or arm whose free end is supported by a caster wheel, there being pulleys arranged on its upper side, in connection with a shiftable brace and tension rod. The wire or cord may be readily and quickly attached or detached, and lies close to the ground, passing between the horses. By the arrangement of the wire beneath the machine and on the suspended guide pulleys the wire does not require to be dragged over, but is simply dropped off the machine and the swiveled guide bar, and is as easily put on again.

Miscellaneous.

BOTTLE CAP.—Bernardo Fontan and Carlos Fontan, Buenos Ayres, Argentina. A cap which may be placed over the mouth of a bottle and brought in engagement therewith, by bearing against the usual shoulder on the bottle neck, is provided by this invention. It is stamped from sheet metal and has downwardly projecting arms at opposite sides, a band being carried by the lower end of each arm, and the bands being adapted to embrace the bottle neck, each band having a flange to engage a shoulder on the bottle neck.

FOLDING BED FRAME.—Jacob Levy, Brooklyn, N. Y. According to this improvement the bed frame is so constructed that it may be folded up to occupy less space than an ordinary bed frame, being designed for use as a cot as well as for full-sized beds. An angle iron frame supports the web or springs, and this frame is supported upon pivoted legs which are connected by links to sliding head pieces, the whole being adapted to fold against the frame. The frame is very strong and of inexpensive construction.

HAT AND COAT LOCK.—Jeremiah D. Burns, Washington, D. C. This is a device for use in hotels, restaurants and other public places, for securing hats, coats and other garments, and affords a cheap and simple fastening as well as an unobtrusive wall attachment. It has a recessed or chambered body in which the locking bolt slides vertically and a peculiar key which holds the bolt locked in open position when the key is fully inserted, the bolt descending and locking the garment in place when the key is withdrawn.

WASHING MACHINE.—Stephen D. Cole, Wallace, Idaho. To facilitate the quick and thorough washing of clothes without tearing or destructive strains, this invention provides a vibrating cage or basket to be immersed within the water in a tank, a slatted and vibrating lid or follower being arranged to bear upon the top of the clothes in the cage and having an opposite movement from the cage. A crank shaft is revolved to impart movement to the cage, an opposite reciprocation being imparted to the lid or follower, the reciprocation being very rapid.

BUNG AND FAUCET.—George C. Kachel and Henry Sager, Girardville, Pa. For bungs for tapping beer and ale casks and kegs, without necessitating the use of a mallet, this invention provides a novel faucet and a bushing and barrel to receive the faucet, so constructed that the kegs or casks will be practically as clean when returned to the brewery as when taken therefrom, as all the liquid may be drained from the receptacle.

FORMALDEHYDE GENERATOR.—Franklin C. Robinson, Brunswick, Me. Heretofore, in generating this powerful disinfectant, a lamp has been used, with a fount in the base for the wood spirit, into which dips a wick, above which is an oxidizing chimney having a platinized asbestos diaphragm, with air inlets below the diaphragm. This invention provides a portable apparatus to more rapidly yield a larger volume of the antiseptic, comprising a shallow pan, an automatic feed device for maintaining a thin film of wood spirit in the pan, above which is an oxidizing chamber, in which, directly above the pan, is a pervious catalytic diaphragm. The pan is relatively large, and the film is rapidly evaporated by heat from the diaphragm directly above and overspreading it, causing a rapid and profuse generation of the antiseptic in a direct and unobstructed manner.

GAS INCANDESCENT.—Oskar Knofler, Charlottenburg, Germany. This invention provides an improved process of manufacture for the mantles of incandescent gas lamps, in which are employed threads of collodion made of an emulsion or mixture of collodion with an inorganic substance, the mixture being forced out of capillary tubes and the threads being either dried in warm air or fixed by passing them through water, an alkali being added to the fixing water. The threads may be spooled, spun or woven, and are denitrated preferably with sulphureted alkalies. They are strong and durable and more flexible than those ordinarily used; so that it is easy to give the mantle any desired shape.

STOP FOR PIANOS.—Alfred R. Spoerl, Brooklyn, and William L. Geisler, Hempstead, N. Y. In mute attachments for ordinary pianos, this invention provides an improved touch and technic stop, arranged to enable the performer to render the piano mute and to permit finger exercise with any degree of resistance to the keys. The invention comprises a novel connection of the mute attachment with the resistance for the keys, and a novel construction of such resistance, which consists of a frame in which slide spring-pressed rods, a bar being adjustably held over the springs, and there being means for shifting the bar and a device for indicating the position of the bar relatively to the springs.

STREET SWEEPER.—John H. Barth, Indianapolis, Ind. This sweeper is adapted to be pushed manually along a street, and has a comparatively large dust receptacle into which the dirt is thrown by revolving brushes at the front. The brush shaft is revolved by belts at each side from the supporting wheels, as the sweeper is pushed along, and the dust chamber has a forwardly extending chute portion with opening close in the rear of the brushes. The drum and all the attached parts may be readily lifted to a tilted position by pressing down on the handle bar at the rear, thus throwing rearward the dirt on the chute.

CENTER FOR ARCHES.—Thomas M. Clancy, New York City. To facilitate the construction of the floors of buildings, this invention provides an improved center for forming a temporary support for the concrete or other filling to be placed between the adjacent floor beams, the center being conveniently placed and adjusted in position according to the shape of the intended arch, and readily removable after the arch is finished. It mainly consists of sheet metal bent to the desired form, and provided on its under side with stiffening ribs or plates, while angle irons are attached to the ends of the sheet.

EYE SHADE.—William S. Bevan, Brooklyn, N. Y. This shade is adapted to be held at a distance from the forehead, being provided with spaced supports which will not absorb perspiration or conduct it to the body of the shade, which may be of delicate and light material. The shade has a series of inwardly projecting, soft, non absorbent pads, formed of cork cushions, to rest against the forehead and hold the shade from contact therewith, while also allowing for the circulation of air between the shade and the head.

BOOK REST.—George K. Putnam, Montpelier, Vt. This invention affords a simple and inexpensive device, more especially designed for conveniently holding account books on tables or desks the surfaces of which are either flat or inclined. The rest comprises a rigid main portion and two sliding side portions, and on its lower rear edge is a hand-supporting plate which may be adjusted along the edge as desired, the plate being useful when the writer has reached the lower lines of the pages.

THILL COUPLING.—Frank V. Stevens, Sr., Brooklyn, N. Y. This is an anti-rattler coupling of simple and inexpensive construction, and which does not require set screws, bolts and nuts. The device comprises a fixed member and a hinged member, the closing of the latter upon the former constituting a socket in which is held the thill iron, the meeting portions of the members being cushioned to exclude dust or foreign matter and prevent rattling, while a novel fastening or locking device is employed, which may be secured by a spring latch, the engagement or disengagement of the thill being quickly and readily effected.

CHIMNEY AND REFLECTOR.—Otto Herrmann, Memphis, Tenn. The opposite sides of the chimney, according to this invention, are provided with integral bearings upon which fit the angular trunnions of a reflector, preferably made of glass coated with mercury, the reflector being somewhat cup-shaped and having a central opening through which the chimney extends. The reflector may be adjusted by turning the trunnions in the socket portions of the bearings, to throw the light in any desired direction.

IRONING MACHINE.—George P. Walter, Brownwood, Texas. A simple and inexpensive machine especially adapted for household or family use is provided by this invention, in which the sad iron may be reciprocated by foot power and shifted sidewise by a hand-operated shifter. The sad iron may be readily connected and removed, and the frame and table are folding, for convenient storage and shipment. Provision is also made for properly weighting the sad iron.

NECKTIE HOLDER.—Winfred J. Herbert, East Liverpool, O. To hold a bow necktie under a turn-down collar, the holder yielding to conform to the collar and yet being rigid enough to retain its shape, is the object of this invention, being an improvement on the pasteboard lining and elastic button loop. This holder consists of a length of wire bent to form upwardly curved side wings and a central loop, the two free ends of the wire being turned loosely over the loop and provided with eyes with which a metal button loop has swinging connection. The resiliency of the wire causes the portion of the tie or bow under the collar to bear up against the inner upper edge of the collar, and securely engage the button loop with the collar button.

MOISTENING DEVICE FOR STAMPS, ETC.—Levin C. Dillon, Brooklyn, N. Y. To facilitate the attaching of labels and postage stamps and sealing of envelopes, etc., this invention provides a novel device in which a bottle-shaped container has a wedge-shaped slotted cap, a plug valve having tapered sides being movable through the slot, and a spring holding the valve yieldingly in its seat. To moisten stamps, etc., the container is inverted and the end of the valve pressed slightly against the surface to be moistened, the pressure forcing the valve inward to allow for the discharge of sufficient water as the device is drawn across the gummed surfaces.

BEER DISTRIBUTING APPARATUS.—Edward D. Case, Flint, Mich. To facilitate the distribution of beer, etc., from one or a series of barrels, quickly regulating the temperature and admitting of one or more barrels being readily cut out of the system, is the object of this invention, means being also provided whereby the pipes in the system may be easily and quickly cleaned by a circulation of water. A series of dispensing pipes is provided with cross connections controlled by independent valves, whereby liquid may be drawn from either one of the supply vessels or may be caused to circulate back and forth between the cross connections, mixing the beer of one or more barrels with that of another barrel, etc.

NON-REFILLING BOTTLE STOPPER.—Peter Lesch, New York City. This is a device which may be applied to bottles, jugs, etc., without any change being made in the vessels themselves, the stopper being complete in itself and independent from the structure of the containing vessel. It comprises a hollow plug having an opening at its outer end, a valve seat upon which rests a valve within the plug, a yoke having a guided movement and connected with the valve and a float adapted by its buoyancy to move the yoke to open the valve. The stopper affords free outlet for the contents of the bottle, but prevents supplying it with additional liquid.

Designs.

HAND BAG.—Louis Sanders, Brooklyn, N. Y. This design is for a bag which has one compartment above another, the lower compartment being reached by breaking the bag between its ends.

CHURN LID.—Edward D. Benninghoff, Creston, Iowa. This invention provides a lid for churns having a revoluble dasher, there being aligned apertures in the lid and in the top of a U-shaped bracket thereon.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS, ETC.

MANIPULATION OF THE MICROSCOPE. By Edward Bausch. Rochester, N. Y.: Bausch & Lomb Optical Company. Pp. 200. Price, cloth, $1.

This useful work gives in clear and concise language all information regarding the principles, and leads to the intelligent use of the microscope. Beginning with the purpose of the microscope, the parts of the instrument are described in detail, together with the principles involved in their construction, followed by a chapter outlining requisites for work. How to work, not only with the microscope, but with its various accessories, is supplemented by a chapter on advanced manipulation. Chapters on how to select and how to care for a microscope contain valuable information, and enable one to select the proper instrument for the work to be done, and to keep it in working order after it has been secured.

SCIENCE VS. THEORY.

BY CYRUS ALDRICH.

Prejudiced theories always disappear before the breeze of scientific inquiry, just as fogs are dissipated by the sun. Guesses cannot forever answer facts, nor uninformed assertion successfully combat the argument that comes from the fine accuracy of expert investigation and chemical analysis. We are finding fresh illustration of this in recent Chicago dispatches in the daily papers regarding the cigarette investigation in that city. Chicago always takes the shortest cut to a conclusion, and its attitude toward the cigarette is a case in point.

The cigarette was under a cloud, but the investigation has failed to demonstrate that the cloud was of its own smoke. Prejudice, catching at hearsays, jumping to conclusions, well intentioned may be, but blind, deaf and self-assured, had condemned the cigarette without formality of trial. The point d'appui of the opposition was the deleteriousness of the cigarette. Strangely enough, every reformer took it as a fact that the cigarette was adulterated. Accordingly, under the direction of a city ordinance, an investigation was ordered. Probably no other health measure has been such a surprise to its sponsors as has this cigarette ordinance. Ostensibly designed to protect the smokers from the unwitting use of harmful drugs, it has simply served to prove more effectively and conclusively, than could the manufacturers of cigarettes themselves, that their product is absolutely free from impurities of any kind. Under the ordinance the Commissioner of Health is instructed to inspect and examine samples of all cigarettes offered for sale, thorough analyses to be made from time to time under his direction. Acting under this authority, City Chemist Cass L. Kennicott and Assistant City Chemist D. B. Bisbee made exhaustive analyses of fourteen brands, and their report is now on file with the Commissioner of Health and open for the inspection of the public.

Prof. Kennicott talks freely of the false ideas that prevail concerning the presence of harmful drugs in cigarettes. Having carried on the analyses with the greatest care and thoroughness, he naturally is positive in his conclusions.

AMERICAN CIGARETTES PURE.

"American cigarettes," he declares, "contain nothing more dangerous than the tobacco itself. Prof. Bisbee and myself made a careful analysis of every brand of cigarettes offered for sale in Chicago during the summer. The samples were gathered at random throughout the city, and the shopkeepers had no knowledge as to whom they were selling. We examined as many as fifty cigarettes of each separate brand. There was nothing wrong with any of them. All were found to be entirely free from opium, morphine, jimson weed, belladonna, atropine or hyoscyamine. Neither was any arsenic or lead found in the paper wrappers.

"As a matter of fact, there is nothing in any of the fourteen brands of cigarettes on the Chicago market that the smoker need be afraid of. American cigarettes are made of bright Virginia tobacco—not only the best in the market, but the mildest. Frequent analyses, made in England as well as in America, show that this tobacco contains only from 1 to 1½ per cent. of nicotine. The mildest Havana contains much more, while the best grades of domestic cigars often reach as high as 8½ per cent. Of course, the less nicotine in your smoke, the less danger of ill effects.

"The idea that arsenic or lead is sometimes found in cigarette papers is equally erroneous. We find arsenic, it is true, in some colored papers, and in wall papers where it is present as a constituent of the color, and we find white lead in highly glazed papers sometimes, and more especially in those glazed cards which were used many years ago for visiting cards. These are the only instances that I know of in which either of these substances enters into the composition of paper in any way.

"As a matter of fact, the paper, considered merely as paper, which is wrapped around cigarettes is about as pure a form of paper as it is possible to get by any means."

The outcome of the investigation, resulting as it does in the absolute acquittal of the cigarette from all charges of impurity, is as satisfactory to cigarette smokers as it is disconcerting to those who have opposed it.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

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Gasoline Brazing Forge. Turner Brass Works. Chicago

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Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Wanted a special article to manufacture, woodwork preferred. Address Box 579, New Haven, Conn.

Improved Bicycle Machinery of every description. The Garvin Machine Co., Spring and Varick Sts., N. Y.

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The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

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Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(7232) H. G. V. writes: 1. I tried to make some batteries. I cut lead plates about 6×7 and roughened them with a coarse rasp, put red lead paste on each side, with strips of asbestic cloth next to each plate and a piece of cardboard between. Have six to eight plates to each cell on the outside of the bunch. I put thin boards with three hard rubber tubes that pass through all and hold them together; each bunch is put in a hard rubber jar. I charged them once and got good results; tried to recharge, but could get nothing. Used the same current both times, which is 125 volts and about 4 or 5 amperes. Do not think they are short circuited. Put them in series with alternate fields. What is the trouble? A. For charging storage cells use a continuous current; place them in series. Allow 2½ volts for each cell. The remaining voltage of your current must be disposed of by resistance coils or lamps, arc lights preferred, since they carry more current than incandescent lamps. Thus, if you have 10 cells, 10×2·5 volts=25 volts. If the current is of 125 volts, there remains 100 volts, which two arc lamps in series will use up. Or you can cheaply make a coil of No. 10 bare iron wire for the same purpose. The advantage of the lamps would be that you can do the charging at night, if you have any use for the light. They should charge in series with the alternator field. If they get 2½ volts per cell, which you can easily measure; but with only 4 or 5 amperes, it will require 2½ to 2 times as long to charge them as with 10 amperes. The probability is that the cells do not get 2½ volts each when in series with the alternator field, since the resistance of the field coil is so great as compared with the very low resistance of the cells. 2. Should they be charged in series or separately? If in series, would I get the same voltage per cell as when charged separately? A. Storage cells are always charged in series. Put as many in one series as will use up the voltage of the circuit at 2½ volts per cell. That is, divide the voltage of the circuit by 2·5; the quotient is the number of cells which should be put in one series thus: 125÷2·5=50 cells. As many such series may be put in multiple as the current can supply. 3. What can I cover the batteries with to keep from spilling the fluid and keep the salts from creeping? A. There is no remedy for spilling, except to keep the battery still. Salts may be kept from creeping by coating the upper edge of the cell with paraffine. Dip the edge of the cell into the melted paraffine. 4 If the field of a motor gets hot on a warm day, would it pay to put an air blast on? A. If the heating is so great as to endanger the insulation, something should be done. It indicates too strong a current in the field. An air blast might cool it; additional external resistance in series with the field will also remedy it.

(7233) A. B. J. asks: 1. Where can I obtain any information regarding size and description of how a solid back telephone transmitter is made, and also what kind of carbon is used in the same? A. See SCIENTIFIC AMERICAN, vol. 72, No. 7. 2. Would carbon such as used in arc lights, finely powdered, answer same purpose? A. Yes; but not quite as well as the polished granules. 3. What is meant by kilowatts or watt hours? A. A kilowatt is 1,000 watts. A watt hour is one watt of electric power flowing for one hour through a wire. 4. What is a Wheatstone bridge? A. A Wheatstone bridge is an instrument for measuring electrical resistance. We should advise you to study carefully some text book on electricity. Avery's "School of Physics," chap. 6, is excellent.

(7234) T. B. B. writes: I have a small engine, the cylinder of which is 2×4 inches. Would you kindly tell me how large a boiler I will have to make to work it economically? A. Your engine at 60 pounds boiler pressure, and with 150 revolutions per minute, should be equal to one-half horse power, and will require a boiler with 10 square feet of fire heating surface. You will find a description and scale drawings for safe boilers of the size you require in SCIENTIFIC AMERICAN SUPPLEMENT, No. 702, 10 cents mailed.

(7235) E. D. A. asks: Will you give the formula for a lasting luminous paint? A. We can send you five papers on the subject of luminous paint on receipt of fifty cents, which will give you all the necessary information.

(7236) W. C. asks: How to wind the 8 light dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT No. 600, to convert the same into a 550 volt motor for direct current? A. You should not attempt to convert the dynamo of SUPPLEMENT No. 600 into a motor for a 550 volt direct current. The design is not fitted for it; the number of turns for the armature coils would have to be too great, and the commutator could not stand the current. The armature would require 40 turns in each coil of No. 28 wire. The same field could probably be used with a regulator of about 400 ohms.

(7237) G. E. R. writes: Will you kindly inform me through Notes and Queries how to prepare a solution to be used as a flux for brazing? What kind of solution or mixture can be applied to remove borax easily after brazing? I have been using borax as a flux, but find some difficulty in getting the spelter to flow into the joints, as the borax seems to fill and keep out the spelter. I also find the melted borax is very hard to remove after brazing; of course dipping the hot parts into water would remove the surplus flux after brazing, but it tempers the steel, which I want to guard against. A. Borax is the only suitable flux for brazing. It should be ground with water to a creamy consistence on a small slab of stone made slightly hollow on the surface to hold the mixture. Hard slate or a fine hard sandstone is most suitable. Use a small brush and smear the surfaces that are to be brazed, with enough outside to hold the spelter from falling off. A small piece of brass laid on the upper side of the joint will often flow through better than the loose spelter. Use hydrochloric acid and water equal parts to clear the joint of borax. Have it hot and dip the work when cooled just below the red; then the steel will not harden. If the borax is not all removed, it may be thoroughly cleaned off by boiling the joint a few minutes in the acid water. See "A New Book on Bicycle Repairing," by Burr, $1 by mail, which fully describes the best methods of brazing.

(7238) J. T. B. asks (1) whether it would not be better to wind the induction coil (SUPPLEMENT, No. 160) all the way across with silk covered wire. A. No; the wire would cost more than it would be worth; the gain would be almost nothing in length of spark. 2. Would not adhesive tape be better for insulating purposes? A. No. Adhesive tape soon dries, and is of no more value than a porous cloth would be; the spark would pass through it easily. 3. Would it be any thinner? A. That would depend on the quantity you used, but it is not a suitable material for the purpose. The insulation of the primary coil must be impervious to air. 4. Is there any battery of higher voltage than the bichromate cell? A. No practical battery. The bichromate battery is the best for your purpose. 5. Have you any issue of your paper describing some experiments with alternating electricity, for which I could use the alternator described in an issue of three or four weeks ago? A. See SUPPLEMENT, Nos. 762, 763, 792, 847 and 855. 6. Can you give me a formula for a liquid to remove rust from a bicycle? A. Try Kerosene oil.

(7239) W. G. M. says: I write you for a little information. I am repairing a water mill with a turbine wheel, and want your advice on the following points: First we have 7 foot head or 7 feet over the wheel and the forebay or water house is 10 feet by 12 square. Now what I want to know is, shall I have any more power if I make the water house larger, or do I gain any power by any water outside of the wheel or any water not directly over the wheel? A. You can gain no power by enlarging the water bay of your wheel. The head or height of the surface above the wheel and the quantity of water that you can make effective on the buckets of the wheel is the measure of your water power. If your race is small, so that it does not keep the water in the bay at nearly full head, the race should be made larger, and not the bay, in order to gain power.

(7240) S. L. asks: Which contains the greater number heat units—one ton of coal or one barrel of petroleum? A. A ton of coal (2,000 pounds) has a heating capacity of about 28,000,000 heat units. A barrel of petroleum (42 gallons, or about 275 pounds) has a heating capacity of about 3,500,000 heat units, or ⅛ as much as a ton of coal.

(7241) T. O. S. asks for the formula of D. W. C. Hoover's pyro and potash developer:

No. 1.

Water	12 ounces.
Sulphite soda crystals	2 "
Citric acid	60 grains.
Bromide ammonium	20 "
Pyro	1 ounce.

No. 2.

Water	12 ounces.
Sulphite soda crystals	2 "
Carbonate of potash	3 "

To develop, take

No. 1	1 drachm.
No. 2	1 "
Water	1 ounce.

To develop a 5×8 plate take water, 4 ounces; No. 1. 2 drachms; No. 2, 2 drachms. If more intensity is required, add more of Nos. 1 and 2. More of No. 1 will restrain and of No. 2 will accelerate.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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NOVEMBER 9, 1897,

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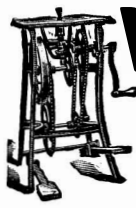

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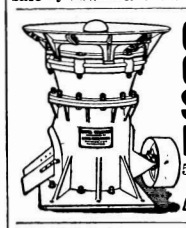

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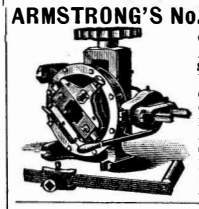

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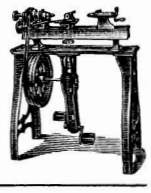

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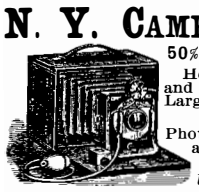

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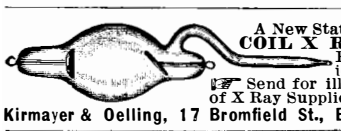

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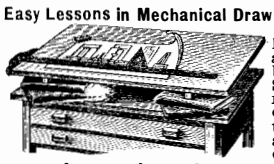

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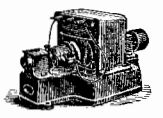

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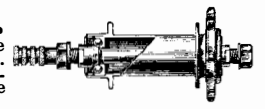

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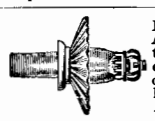

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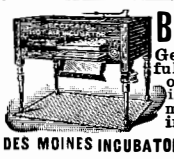

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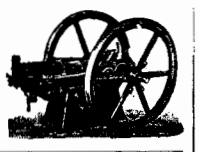

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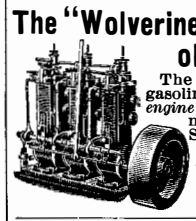

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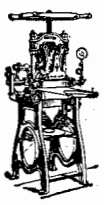

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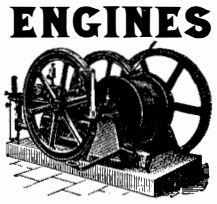

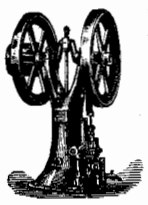

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Sub Press Dies
For Punching and Forming Sheet Metal
A SPECIALTY.
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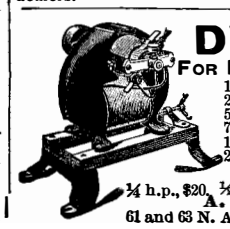

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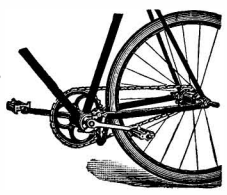
Automatic Coaster and Brake.

Wheel Always Under Perfect Control



Because Your feet Are always On the Pedals.

The Coaster consists of automatic clutch in the rear sprocket, which is thrown out of gear by holding the pedals still. The machine moves on with the chain and sprockets stationary and your feet on the pedals.

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Touring Made Easy. Street Riding Made Safe.

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Box X, ELMIRA, N. Y., U. S. A.

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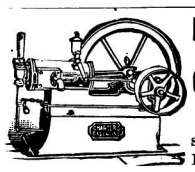

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Write for Advance Sheets. 1898 Prices Ready.

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Strong adjustable bracket sent with each lamp.

HANDSOME PRACTICAL MECHANICAL

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Endorsed by the Leading Carriage Builders.
TO RIDE EASY, GET RUBBER TIRES.
The Kelley, Maus & Co. Tire is the best on the market.
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Guaranteed satisfactory or money refunded. Hard Rubber Holder, 14k. Gold Pen. Never Drips—Never Skips.
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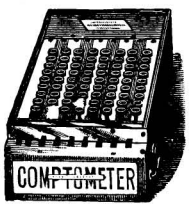
At ¼ Price Bicycles, Watches Guns, Buggies Harness, Sewing Machines Organs, Pianos Safes, Tools Scales of all varieties and 1000 other articles. Lists free CHICAGO SCALE CO., Chicago, Ill.



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who use the Comptometer
have no trouble with their trial balance. Has it ever occurred to you that by getting one you might save lots of time, avoid mistakes and not ruin your nerves?
Write for Pamphlet.
FELT & TARRANT MFG CO.
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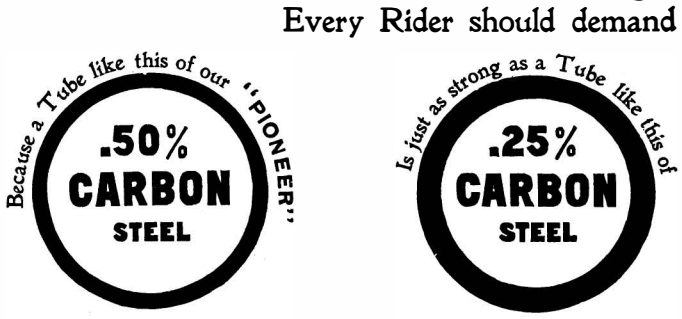
.50% Carbon Pioneer Brand Steel Tube

Every Bicycle Manufacturer should use it.
Every Dealer should insist on having it.
Every Rider should demand it.



While WEIGHT FOR WEIGHT in a Bicycle our **FIFTY CARBON** Steel will last so long and **TWENTY-FIVE CARBON** Steel will last only so long . . . . .

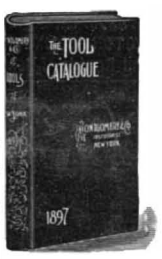
NOTE THE FULL IMPORT OF THE PARALLEL LINES.

The comparison which they graphically make indicates the result of the prolonged investigations of the most practical experts of the world.

That the tests in our own laboratory corroborate these results is merely so much to its credit; that the same is true of actual trial on the road equally proves the trial to have been made in bicycles of correct design and construction. THE FACT REMAINS UNDISPUTED,

The Margin of Safety is Greatly Increased by the Use of This Tube.

Send for Catalogue. **THE POPE TUBE CO., HARTFORD, CONN.**



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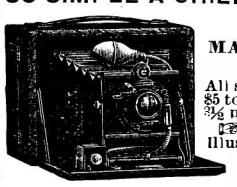
SO SIMPLE A CHILD CAN USE THEM



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Folding Cameras.

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SUNART PHOTO CO.
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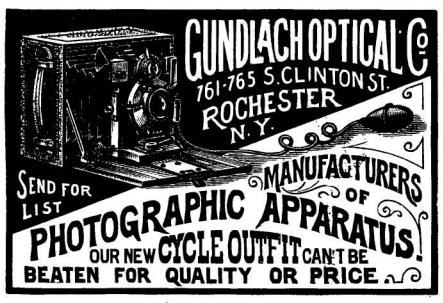
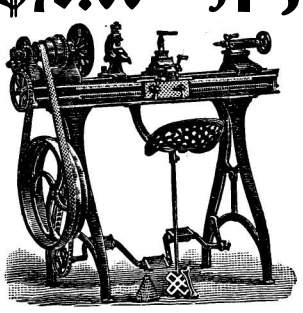


$75.00 A Foot-Power Lathe $75.00



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and Outfit of Tools

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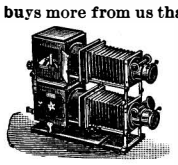

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